THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXX. No. 1798.] LONDON, OCTOBER 26, 1897. [49TH YEAR. PRICE 6d.

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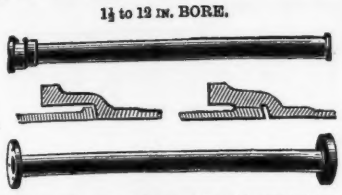

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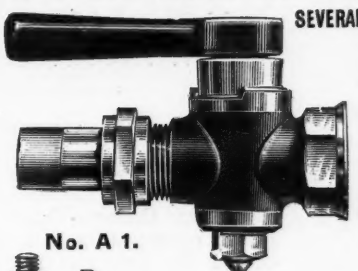

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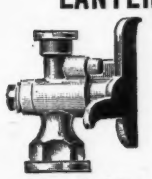

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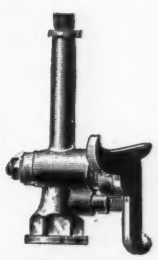

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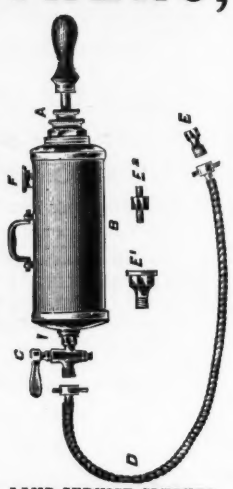

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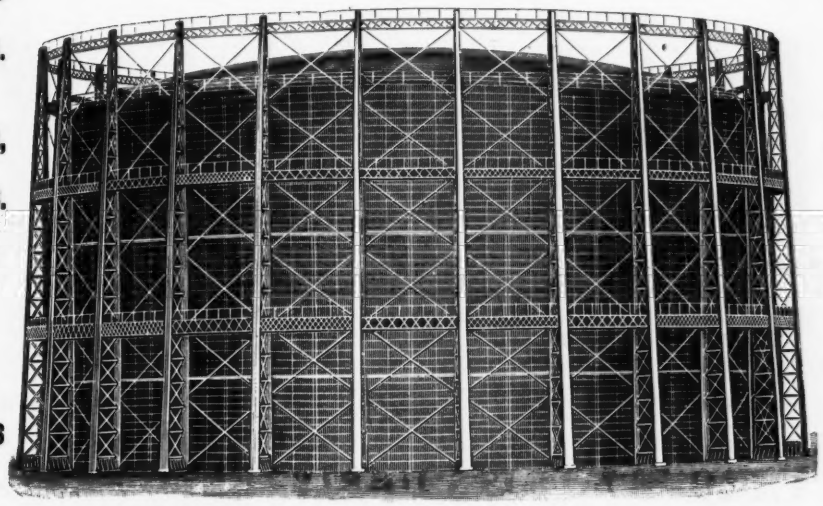

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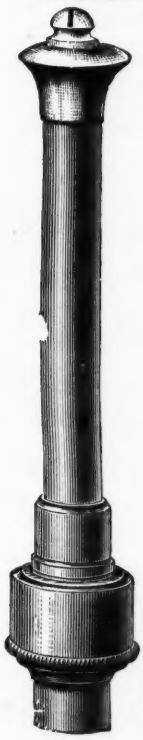

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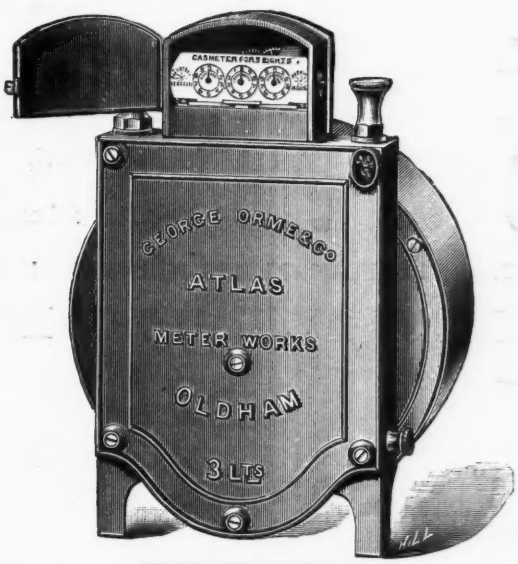

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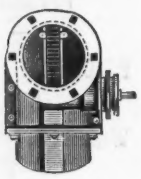

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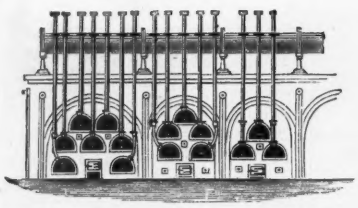

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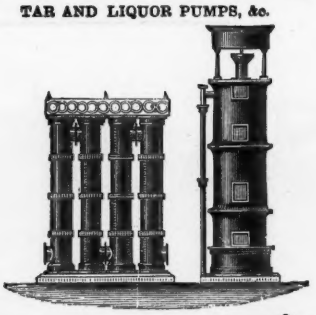

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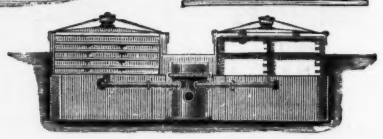

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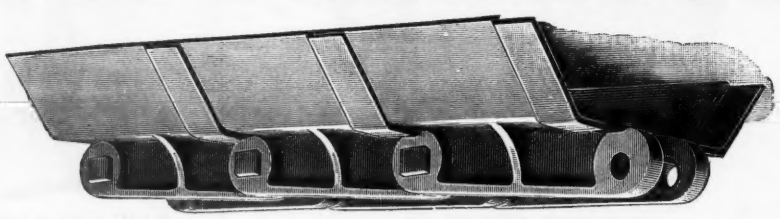

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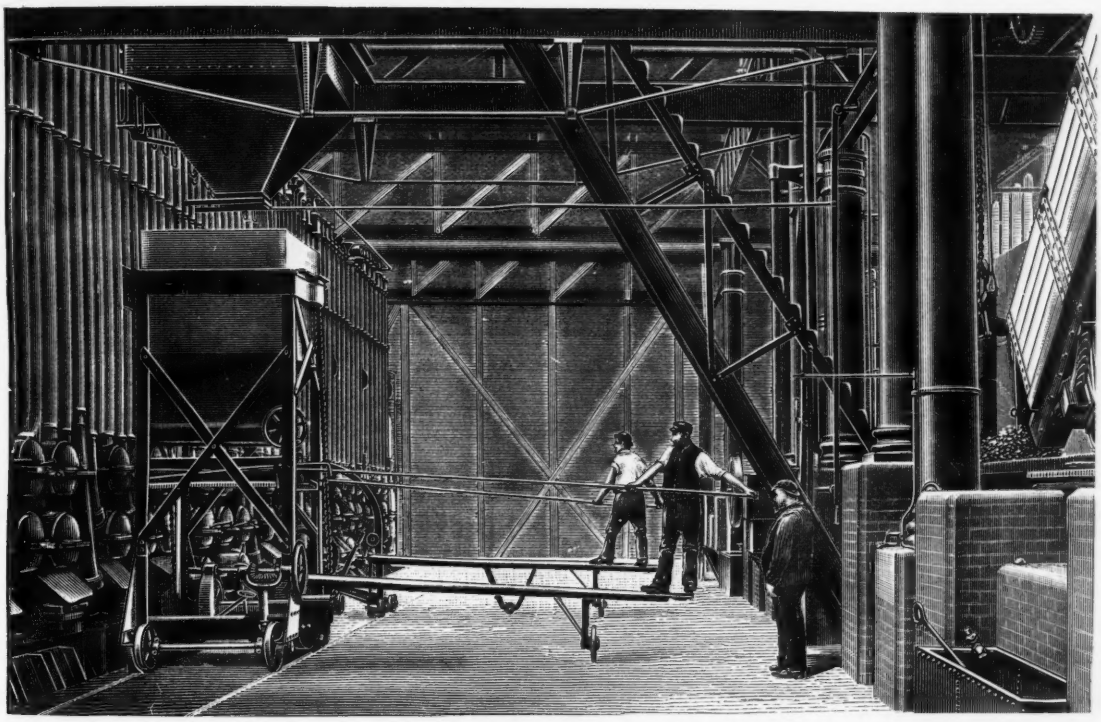

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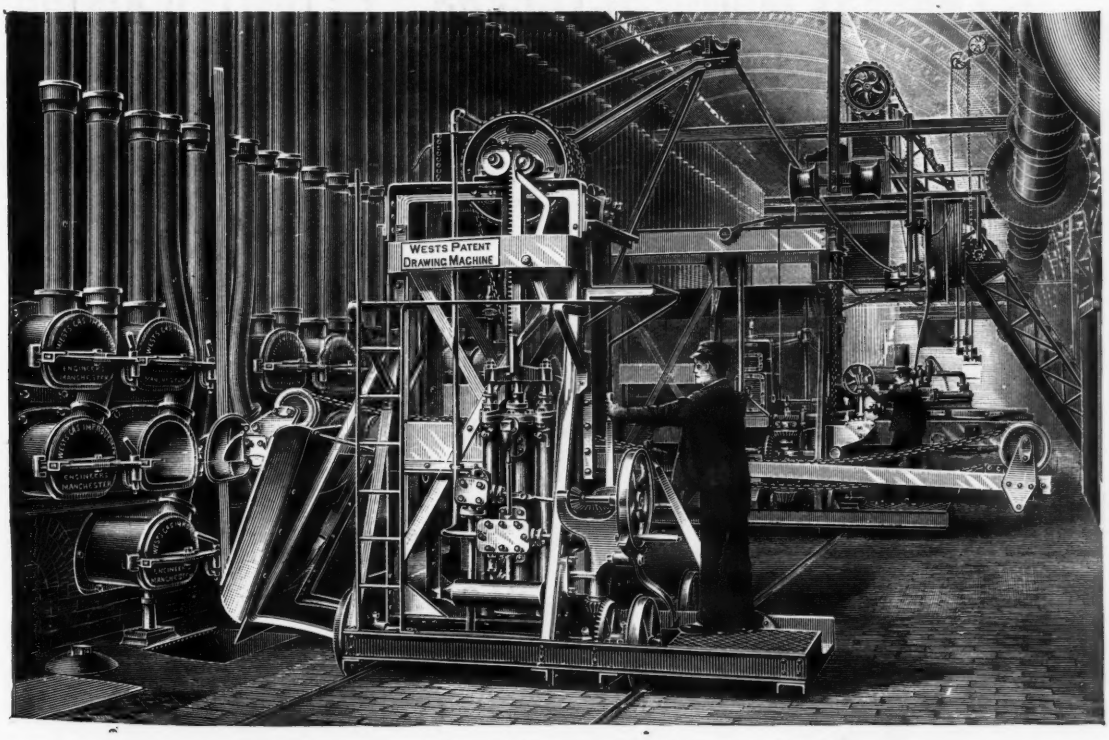

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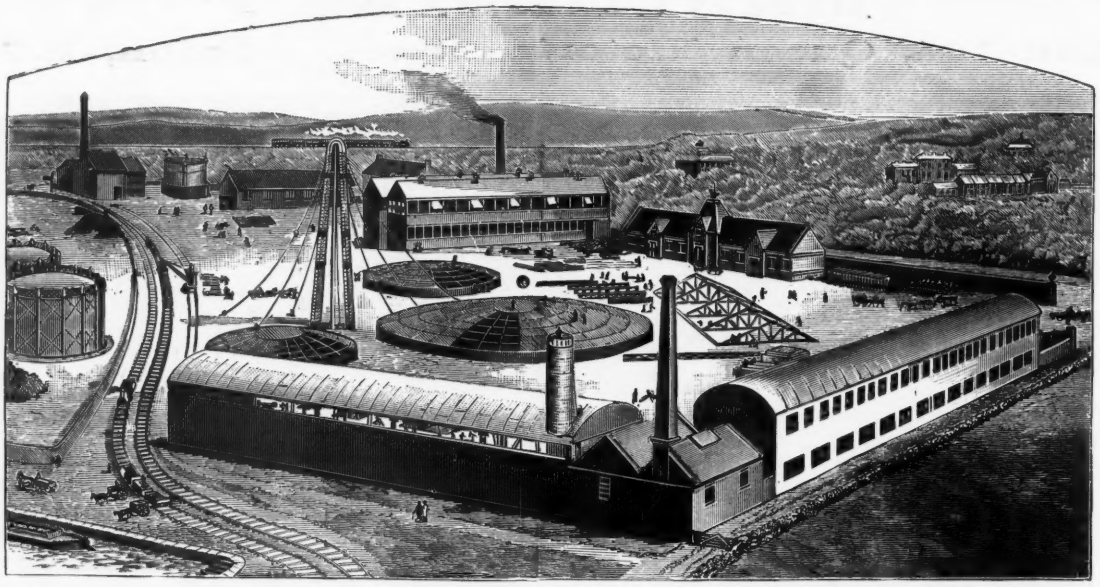

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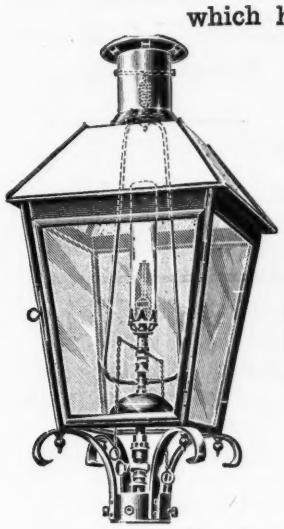

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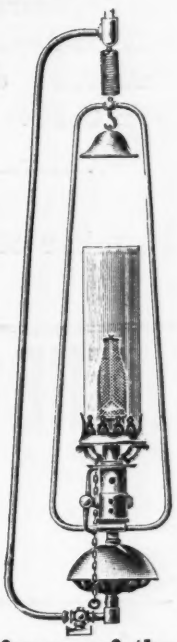

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"The success of the experimental (Welsbach) lighting secured the contract for one of the Parish Council Districts; and this was shortly followed by the contract for three years for the city lamps. The total represents altogether about 500 single lamps, and 15 refuge lamps containing two lights."

"In the matter of maintenance of the street lights, the record is favourable—in fact, more so than the estimate provided. By the test-meter, the average daily consumption works out to 38 cubic feet per light, including bye-pass. The bye-pass consumes with a flame half an inch long, $\frac{1}{6}$ foot per hour. This represents 1000 cubic feet per lamp per annum. The average consumption per light, when in use, works out to 12,900 feet per annum, or about $3\frac{3}{5}$ feet per light per hour. The lighting is continued all the year round, from the average times of one hour after sunset to one hour before sunrise."

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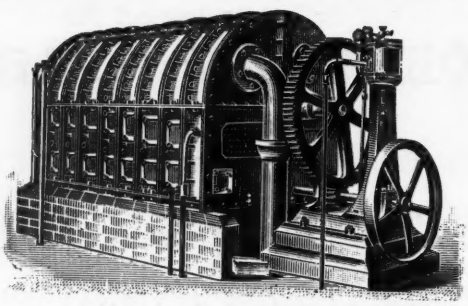

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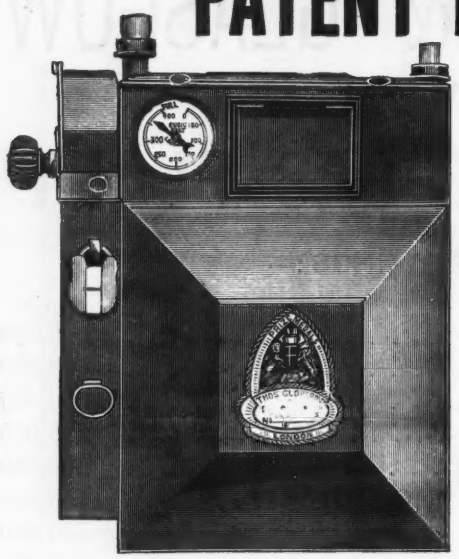

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EDITORIAL NOTES.

The Engineers' Strike.

THE engineers' campaign has apparently settled down to the conditions of a life-and-death struggle, in which neither side will give or accept quarter. The small diversion occasioned by the revolt of some London boilermakers against their own Union Executive is probably only a case of the men having caught the "strike fever," and will not affect the working out of the main question. A meeting of the Federated Employers in the London district was held on Tuesday, under the presidency of Mr. Alexander Siemens, when the result of the recent meeting of the Executive of the Federation at Leeds was reported. It was resolved—"That the Committee of the "London District Employers be instructed to communi- "cate with the Executive Committee of the Federation "and express their hearty approval of the three resolu- "tions passed at Leeds [*ante*, p. 783]; and they desire "that the terms therein named should be strictly observed." On Wednesday last, "The Times" published a letter from Sir Christopher Furness, who wrote neither as an employer of engineering labour nor as an outsider, but as one who has "more steamers and engines building under contract "than any individual or firm in the United Kingdom." The writer claimed that there are few men who have advocated Trade Unionism more than himself. If he felt that the object of the Employers' Federation was to kill Trade Unionism, he would have no connection with it. Of this, however, there is not the smallest danger from anything the employers can do. If Trade Unionism is to be crippled or killed, "it will be by some of the men's "leaders of what may be termed the 'new school,' and "not by the masters." Sir Christopher Furness considers that a grave responsibility rests upon the leaders of the Amalgamated Society of Engineers; and he recommends taking a vote of the men on the present issue.

Friday's newspapers contained the text of a communication addressed by the Board of Trade to the Secretaries of the Employers' Federation and the A.S.E. This letter referred to the responsibilities placed upon the Department by Parliament, and submitted a rough draft of terms of an arrangement which it was suggested might be considered by both parties in conference. These were as follows:—"(1) The Employers' Federation, while disavowing any "intention of interfering with the legitimate action of "Trade Unions, will admit no right of interference with the "management of their business. The Trade Unions, on "their part, while maintaining their right of combination, "disavow any intention of interfering with the manage- "ment of the business of the employers. (2) The demand "for a 48-hour week made by the Joint Committee on the "Federated Employers in London without previous request "for a conference with the employers is withdrawn. (3) A "conference between representatives of the Employers' "Federation and the engineering Unions concerned in the "dispute shall be held forthwith to discuss and settle the "hours of labour. (4) The constitution of the conference to "be arranged between the Chairmen or other selected repre- "sentatives of the parties." Up to the moment of writing, these terms of reference had not been accepted by either side. The men's leaders continue to parade their willingness to meet the employers in conference, and are manœuvring to throw upon the Federation the responsibility of being the first to reject the overtures of the Board of Trade. At the same time, the proposal to withdraw the claim for the 48-hour week in terms that may be taken as implying that it had been improperly preferred in the first instance, is not welcomed by the strike leaders.

Meanwhile, a sentimental appeal to the employers "to "reconsider their refusal of the mediation proposed to them "by the President of the Board of Trade, which the men "expressed themselves willing to accept," has been put in circulation by a number of well-meaning but distinctly tactless clergymen, headed by the Bishop of Hereford. The hint conveyed in the passage we quote, that in the opinion of the reverend memorialists the employers are inclined to be more recalcitrant than the men, is not calculated to placate the former. It is so easy for outsiders to formulate glib commonplaces about the desirability of something being done to terminate "a conflict which is "disastrous to the national well-being and discreditable "to the national honour, and which, moreover, if further "continued will inflict widespread and cruel misery upon

"multitudes of innocent women and children." But why address the reproach for bringing about this deplorable state of affairs to the party that did not begin it? What about Mr. Barnes, the Secretary of the A.S.E., and his light-hearted expressions when war was declared in the "popular" cause of eight hours' work for nine hours' pay? What about Mr. Mann's declaration that when the strikers had gained their point it would only be the beginning of a forward policy? There can be no conference or mediation while one side has no claim to prefer, and the other makes claims to which it is determined to adhere. Bad as the case is, it is better that it should be carried through on the natural lines than that a hollow peace should be patched up which would leave the old causes of disturbance still smouldering.

The Association of Municipal Corporations and the Borough Funds Act.

THE autumn general meeting of the Association of Municipal Corporations was held on Friday. There was a very large attendance of delegates from all parts of the country. Sir Albert Rollit, M.P., presided, and took an early opportunity for congratulating Mr. J. C. Bigham, Q.C., who has been Vice-President of the Association for a long time, upon his elevation to the Bench. The first business resolution submitted to the meeting was by the Lord Mayor of Dublin, and was as follows: "That it be an instruction to the Council and Law "Committee that in any Bill which may be promoted "by the Association for the amendment of the English "Borough Funds Act, similar provision should be made "for amending the Irish Act." The resolution was seconded by the Mayor of Cork, and was passed unanimously. We should like to have Sir Albert Rollit's candid opinion, as a statesman, on this suggestion, regarded in the light of recent Dublin history. It is notorious that municipal bodies throughout the kingdom are desirous of having greater freedom in respect of taking parliamentary proceedings than the existing law allows; and the desire is one that to those imbued with a spirit of progressive Municipalism appears perfectly right and reasonable. There are others, however, who are not disposed to admire that working of our local government system which tends to give the corporation a too independent and selfish existence in the community. Corporations, like boards of directors of public companies, are always in danger of losing touch with their constituents and those whom they are supposed to represent, and taking up a line of policy of their own. This must be so, to a certain extent; for people who have the responsibility of administration confided in them must be allowed to exercise it in their own way. Our system of local self-government, like our joint-stock company system, is, in the long run, justified by the fact that in the great majority of cases those who exercise authority are honest and capable men. Yet the spirit of bureaucracy is so insidious, the pressure of municipal politics is so strong, the lust of power is so masterful, that any severance of municipal corporations from the general body of ratepayers is to be deprecated. It may be, and possibly is the case, that the Borough Funds Act does not perfectly fulfil its object. If so, it can doubtless be amended. Experience of the performances of the London County Council, which is the one urban authority of the county exempt from the operation of the Act, is not reassuring as to the consequences that might be expected to flow from its general abrogation.

Municipalization at Falmouth.

THE Corporation of Falmouth are about to make another attempt to persuade the ratepayers to sanction an application to Parliament for the purchase of the gas and water works. It is a big and ambitious scheme, and many of the councilmen approach it in only a half-hearted manner. When it was discussed the other day at a meeting called for the purpose, a number of them found that they had engagements elsewhere; and of those who were present, two or three sat more or less gracefully on the fence, ready to climb down on either side. This attitude is not heroic, and suggests that there is an element of unreality in the clamour which has recently been raised over the purity of the water. It is perhaps nothing more than an undesigned coincidence that the agitation against the Water Company for not taking sufficient precautions for the protection of the water supply is followed so quickly by the revival of the purchase scheme. Yet, if it had been got up for the purpose, it could not have been more skilfully planned so as to work upon the feelings of the ratepayers. A year ago the townspeople rejected the proposals submitted by the Corporation because of their weakness on the financial side. Now they will be appealed to to sanction the purchase on the ground that it is to the interest of the town, which is always seeking to advance its reputation as a health resort, to control the sources of water supply. Last year the dominant idea was to get possession of the gas-works as a means of relieving the rates and enabling the Corporation to buy the water undertaking. This time the water is to have precedence. Whether the ratepayers will think any better of the scheme because of this difference in the order of procedure remains to be seen. If one may judge from the manner in which the scheme has been taken up by the Corporation, its prospects are not at all brilliant. There are a few members who find comfort in the blessed word "municipalization;" but the rest seem disposed to "let "'I dare not' wait upon 'I would,'" until the ratepayers have made up their mind for them.

The Petroleum Committee.

MENTION has been cursorily made in the "JOURNAL" on various occasions of the existence and proceedings of the Select Committee of the House of Commons on Petroleum. We have refrained from discussing at length anything that has transpired from time to time in connection with this inquiry, preferring to wait for the official report. This has now appeared in the form of a Blue-book, the bulk of which is made up of the minutes of evidence. The actual report, in point of fact, consists of four lines; being merely a statement that it has not been in the power of the Committee to complete the investigation, and a recommendation that the inquiry should be continued next session. The evidence already taken is extensive and valuable; and we commence an abstract of it in another column. It is unnecessary to argue for the importance of a general technical and commercial knowledge of the petroleum trade to those who follow the gas industry. So far as the inquiry of the Committee has gone, it has not merely shown the extent and character of the petroleum oil and lamp trade, but has brought into publicity many of the most influential persons actually engaged in it. This is a considerable advantage to all those who are interested in the trade either directly or indirectly. The inquiry arose out of an endeavour that was made to procure a strengthening of the law that relates to the "keeping, selling, using, "and conveying" of petroleum—not altogether, as was suspected, without the ulterior intention to "protect" the languishing Scottish oil industry. Advantage was taken of a small scare in respect to the "deadly oil-lamp" to procure the appointment of the Committee; and it was confidently expected by those who identified themselves with the Scottish oil interest that it would be easy to make out a case for raising the flash-point of 73°, which at present marks the distinction between petroleum oil and petroleum spirit, to something like the figure—100° or thereabouts—appertaining to the Scottish product. The question for and against the suggested alteration has been debated with considerable vivacity; but the conclusion is not yet in sight. It is certain that if the partisans of high-test oil can have their own way, those who consume mineral oil largely, whether for lighting or for industrial purposes, including the manufacture of illuminating gas and the production of motive power, will be seriously affected in various respects.

A Complaint of the Steam-Roller.

ONE does not nowadays hear so much from gas engineers concerning the iniquities of the steam road-roller as was customary a few years ago wherever gas managers met together. The roller is still with us, but its limits of weight have been reached; and its operations must either be less inimical to gas mains and services, or they must be more patiently endured. Time was when everybody except gas and water works engineers looked upon the steam-roller as one of the triumphs of civilization. And when, during some of the litigation to which the use of this appliance gave rise, it was sought to be shown that steam-rolling was not the best way to make a good road surface, the suggestion was scouted as being the outcome of prejudice. After all, it would seem that the views of the gas engineers are to be justified by independent testimony coming from a quarter utterly strange to them—the interest of mechanical traction for common roads. Mr. W. Worby Beaumont,

who is an authority on mechanical road carriages, gravely questions in the "Engineering Magazine" the efficacy of the steam-roller as generally employed for the making of roads. He draws attention to the fact that in many districts the macadam roads are just as bad two or three months after making and rolling as they were after making without steam-rollers thirty years ago. "This is equally "true of the macadam roads in and round London. It is "said that one of the great causes of this is, first, the large "size of most of the granite road-metal used; and that "another is due to the production in rolling of lines or "centres of looseness at more or less regular intervals." This is as much as to say that the application of mechanical power to the breaking of road-metal and the rolling of the surfaces of roads has not had the good effect attributed to it by superficial observers, and accepted almost without question by highway authorities in both town and country. The truth is that, thanks to the bicycle and the (nascent) mechanical road carriage, the attention of the public is being drawn once more to the state of the roads; and it is hardly to be wondered at that the steam-roller, which is a relic of an earlier era, occasionally fails to show up well in the fierce light now beating upon its operations. Coarse road-metal has gone with the steam-roller hitherto, with the addition of plenty of dirt to cause it to "bind." If Mr. Beaumont or anybody else can persuade our highway authorities that these are not the correct elements for making a good road, the gas interest, which has been long-suffering in this regard, will be grateful for the relief.

No Bimetallism for England.

REFERRING to our *excursus* last week into the morass of the bimetallic controversy, it is to be noted that last Saturday's daily papers contained particulars of the negotiations that have been in progress since July between the special envoys of the United States, the Imperial Government, and the Government of India, upon the silver question. With engaging modesty, the special envoys asked that the Indian mints should be opened, and the order making the sovereign legal tender in India repealed. They also proposed that one-fifth of the bullion in the Issue Department of the Bank of England should be in silver; that the legal tender of silver should be raised to £10; that 20s. notes based on silver should be issued, and the half-sovereign retired from circulation in favour of paper based on silver; and that the British Government should purchase some £10,000,000 worth of silver annually. Several additional and alternative proposals were made from the same quarter. It is not necessary for anybody to be an expert in matters of currency to perceive that the acceptance of these proposals would mean an alteration of the centre of financial gravity; and it is much to Lord Salisbury's credit that he was able to "nail to the counter," so to speak, the first definite bimetallic scheme that has ever been formulated. The next step was to obtain the opinion of the Government of India on the proposals. The letter in which this opinion was given is one of the most luminous and instructive State papers in existence. Everybody who desires to understand the subject should study it. The question put to the Indian Government was "whether the Indian mints "may be reopened to silver as part of a contemplated "arrangement under which France and the United States "of America will open their mints to silver as well as gold." The object which the proposers of the United States scheme have in view is the establishment of a stable relation between the values of gold and silver; and the idea was to make India bear the brunt of the experiment. This burden the Government of India politely, but firmly, decline to assume. If all the nations of the world would bind themselves in perpetuity to treat silver and gold as interchangeable in the ratio of $15\frac{1}{2}:1$, the case might be different. At present the market ratio is 35:1; and the discrepancy between these ratios is too great to warrant the expectation that those whose interests lie at the opposite ends of the scale will agree as to which is to be sacrificed to the other. Lord Salisbury has summed up the question in a despatch which unreservedly endorses the view of the Indian Government. In these circumstances, it becomes unnecessary to discuss the remaining proposals. The Prime Minister is courteously anxious to learn how the American and French Governments feel in the present turn of affairs, and whether they are disposed to continue the negotiations. All this means shortly that the English sovereign is to remain the standard of value, and that it is to be kept unaffected by the plenitude or scarcity of silver, so far as the Imperial Government can ensure this result. "For this relief much thanks," will be the cry of the City. Some other application must be found for the masses of silver bullion which the United States Government have purchased at twice the value of the metal in the market of to-day, and for which the effete Old World has no need.

WATER AND SANITARY AFFAIRS.

IN their last monthly report on the London Water Supply, issued on Thursday, and addressed as usual to Major-General A. de Courcy Scott, the Official Water Examiner, Sir William Crookes and Professor Dewar have delivered themselves in such clear and decisive terms respecting the supervision exercised over the Water Companies, that the daily papers have not been able to pass the statement by in silence. To the public generally, as well as to the greater part of the Press, the purport of the report may come as a surprise, though to those who have cared to look into the subject the only remarkable thing that appears is that it should ever be needful to call attention to such ordinary facts as are now made prominent. That the people of London fail to realize the extent of the provision which promotes their safety in respect to their water supply, is perhaps less singular than for the local Vestries of the Metropolis to act as though it depended on their vigilance to guard against the distribution of polluted water in the Metropolitan mains. Of course, an expert analyst like Mr. A. Wynter Blyth will only confirm what has already been reported by Sir W. Crookes and Professor Dewar. So in the case of other analysts, if their results are correct, such cannot do otherwise than agree with those founded on the daily examinations carried out by the highly qualified chemists who have been engaged for the purpose. The public gain no additional security, but there is a little further expenditure charged to the rates.

The circumstance that Sir William Crookes and Professor Dewar are employed by the Metropolitan Companies to inquire into the quality of the water may encourage an idea in suspicious minds that these eminent chemists are likely to be in some degree biassed in their conclusions by the origin of their engagement. Any such idea is clearly untenable, in view of the fact that the chemists so engaged by the Companies are placed in the position of "absolutely independent scientific authorities." The Companies' officers are not enlightened beforehand as to what will appear in the coming report, neither have they any opportunity of influencing its contents. But the chemists feel it their duty to call the immediate attention of the Companies to any anomaly, however slight, which may appear in the character or the quality of the filtered water; and it would obviously be very absurd for the analysts to delay any such intimation until it figured before the world in their monthly record. Truly it may be said there is no city in the world where such minute and incessant care is taken daily and almost hourly to detect and report on the slightest deviation from purity in the water supply. Supposing it to be urged that the results would be more trustworthy if they emanated from an Imperial or a Municipal department, there is the ready reply that, in the absence of any such provision, the Companies rendered the public valuable service in providing at their own cost such an arrangement as now exists. It is not likely that two such authorities as the Companies have secured for the purpose would either blunder over their work or misrepresent the facts. The Companies themselves require, as already intimated, early and correct information as to the state of the supply, so that they may know how their filter-beds are working. A very important paragraph contained in the present report is that wherein it is stated that specific tests are frequently made for the discovery of pathogenic organisms. It is pointedly added: "If any other than a negative "result had been obtained, the fact would have been "recorded." In relation to the past month there is the assurance that the water supply was in a higher state of purity than in the corresponding month of last year.

As affording further ground of confidence in the reports by Sir W. Crookes and Professor Dewar, there are the monthly reports by Sir Edward Frankland, addressed

to the Registrar-General, which give abundant support to the returns laid before General Scott by the other chemists. If danger arises, the public will certainly hear of it; and if no warning note is given, the people of London may rest assured that all is well. In Sir E. Frankland's report for the past month, we find it stated that the New River supply was delivered to consumers "in most excellent "chemical and bacterial condition, surpassing, in respect "of organic purity, most of the deep-well waters." The health of London continually testifies to the excellence of the water with which its inhabitants are supplied, and affords an unfailing standard appealing to the common sense of everybody. There is also the constant guarantee that, if anything goes wrong, the fact will be immediately trumpeted forth from Spring Gardens. For the present, the General Purposes Committee in that quarter are cogitating the Metropolis Water Act, 1897, concerning which they are going to inform the County Council to-day that they are not yet in a position to bring up a report, but they hope to do so shortly.

OBITUARY.

The death is recorded of Alderman W. Collinge, J.P., of Burnley, who for a number of years was an active member of the Gas Committee of the Corporation. The sad event occurred on Thursday last at the deceased gentleman's Southport residence. He was 53 years of age.

PERSONAL.

Mr. T. Clayton has resigned the position of Manager of the Machynlleth Gas-Works, to take the superintendence of the gas-works of the Accrington District Gas and Water Board.

Mr. W. Arnot, the Chief Electrical Engineer to the Corporation of Glasgow, has resigned his appointment, in order to commence business as a Consulting Electrical Engineer.

The management of the Rye Gas-Works has been relinquished by Mr. J. Watson, on account of ill-health. In recognition of his service of upwards of a quarter of a century, the Chairman of the Gas Company (Mr. J. Bowen) recently presented him, on behalf of his colleagues and some of the shareholders, with an illuminated address.

In connection with the resignation of Mr. H. Percy Boulnois of the City Engineership of Liverpool, the Health Committee have passed a resolution expressing their regret at his severance from them, and at the same time their hope that he will have success in the new sphere of life on which he is entering. At last Thursday's meeting of the Committee, an illuminated and framed copy of the resolution was presented to Mr. Boulnois.

Mr. T. B. Younger, Assoc.M.Inst.C.E., for many years Engineer and Manager of the Georgetown (British Guiana) Gas Company, has commenced practice as a Consulting Engineer, Valuer, &c., in conjunction with Mr. Llewellyn Jones, at Chesterfield House, Great Tower Street, E.C. Messrs. Llewellyn Jones and T. B. Younger—as the style of the firm is—are already representatives of several well-known makers of sugar and gas plant specialities; among others of Messrs. Clapham Bros., Limited, of Keighley.

Mr. J. P. Hallaway, who, as already mentioned in the "Journal," has left the service of the Carlisle Corporation in order to take up his duties as Assistant-Engineer to the Colombo Gas and Water Company, has been presented by the workmen and officials in the Gas and Water Department with a gold albert chain and appendage, as a mark of their esteem. The presentation was made by Mr. C. B. Newton, Assoc.M.Inst. C.E., F.C.S., the Gas and Water Engineer, who assured Mr. Hallaway of the hearty good wishes entertained for him.

Mr. W. A. Padfield, the Manager and Secretary of the Exeter Gas Company, has been presented with an address of congratulation, accompanied by a service of plate which cost 100 guineas, on the completion of twenty-five years' service, and as a mark of the proprietors' appreciation of his efforts on behalf of the Company. The local papers, in referring to the presentation, add their tribute to the success of Mr. Padfield's services. When he was appointed, the works were in a very unsatisfactory condition. They have since been reconstructed, and the price of gas has been reduced; and the shareholders, in addition to having a fine property, get the maximum dividend allowed by their Act of Parliament.

Ultra-Sensitive Gas Consumers.—The managers of the gas-works in two towns in Switzerland are reported to have refused to introduce prepayment meters on the ground that they dare not approach possible customers with an instrument which casts so shameful a reflection on their integrity! Even in Germany, Herr Reichard, the Manager of the Carlsruhe Gas-Works, recommends his professional brethren to avoid the use, of the expression prepayment meter ("*vorauszahlungsgasmesser*") in deference to the feelings of patrons of this class of meter.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 909.)

Business in general was extremely inactive on the Stock Exchange last week. But in spite of things being so slack, every department, with hardly an exception, held very firm and here and there a tendency to advance was apparent. The situation remained thus until the Bank return came out, and produced a feeling of considerable uneasiness as to what price money might be going to. With the settlement staring them in the face, operators thought it advisable to close; and prices receded accordingly—the gilt-edged class being a chief sufferer. The question of how long the Bank rate would last, to which we referred last week, has rapidly come to the front for serious consideration. At present all is uncertainty, dependent upon gold movements as yet unknown; but the possibilities are such that no one would be surprised if the rate went up to 4 per cent. Business transacted in the Gas Department showed a considerable falling off in point of volume from the standard of the preceding week. And this slackness seemed to have a rather depressing effect; for the prices of the two leading issues were disposed to recede—a tendency which became more pronounced towards the latter end of the week, when the weakness became general. Thus Gaslight "A," opening at 317½, drooped gradually until the closing mark was no better than 313½, with a weak tendency. But the secured issues were not only active but strong; and the 4 per cent. debenture rose a point. South Metropolitan, after changing hands more than once at 147, could not keep up its command of those figures, and dropped a point—a "special" bargain being even marked at 144. The few dealings done in Commercials showed no tendency either way. Transactions in the Suburban and Provincial division were quite as numerous as usual; and the general tendency was firm and steady, though Alliance slightly receded. But Brighton had a good rise. The Continental Companies were rather quiet; but they were quite steady and unchanged. Among the rest, the only feature was a large advance in San Paulo, in consequence of their new agreement with the Local Authority. The Water Companies were a little more active all round, and were firm generally; while Lambeth and West Middlesex advanced their prices.

The daily operations were: Business in Gas on Monday was not very extensive; but was pretty well distributed through the list. Prices were steady generally; and San Paulo rose ½. In Water, Lambeth tens gained 3; and West Middlesex, 2. Transactions fell quiet on Tuesday; and prices were not particularly good. Gaslight "A" dropped 1; but ditto 4 per cent. debenture advanced 1; and San Paulo, ½. There was a shade more activity on Wednesday, coupled with steadiness in prices. Brighton and Hove rose 3; and San Paulo, ½. Quietude prevailed on Thursday; and prices showed no disposition to advance, though San Paulo again improved ½. Alliance and Dublin new fell ½. On Friday, the weak tendency was accentuated—Gaslight "A" and South Metropolitan receding 1 each. The tone continued to be the same on Saturday; and Gaslight "A" lost 1 more.

ELECTRIC LIGHTING MEMORANDA.

A Table of Electricity Supply Undertakings—The Question of Finance—Also that of Expediency.

With the current number of the "Electrician" there is given a tabular statement of the capital expenditure and the working accounts for the past year of statutory electricity supply undertakings in London and the Provinces. These tables are very useful, so far as they go; but, unfortunately, they are not complete. Some electric lighting companies exhibit an incurable reluctance to publish more of their accounts than they are obliged; and much of the data supplied by local authorities engaged in this enterprise requires some adjustment. Still, there is a good deal of valuable information presented in a handy form in the tables; and certain of the conclusions deducible therefrom are set forth in an accompanying article. Some of our contemporary's observations are not such as a gas engineer could accept in their entirety. It is stated, for example, that the older industry of gas lighting had no serious competitor for three-quarters of a century, which was the reason for its present great development and high prosperity. "The house-to-house public supply of electricity dates only from 1889." To make the observation complete, it should be capable of proof that since 1889 the gas industry has declined, or at least experienced a check; whereas everybody knows that the directly opposite result has been realized. However, it is unprofitable to discuss this point at length. What is more interesting is the fact, as our contemporary puts it, that to-day "there are over one hundred municipal and joint-stock electricity supply undertakings at work in London and in the Provinces, with an aggregate capital expenditure of some £10,000,000, and a total lamp connection of certainly not less than three millions." Assuming these figures to be correct, it bears out our previous remark as to the incompleteness of our

contemporary's table when it is found to include only sixty-two undertakings all told.

It is claimed that the money invested in these electric lighting ventures has been well laid out, and is yielding a fair return. Inasmuch as the table prudently stops short of giving the percentage of profit realized, this assertion can only be tested by further working out the figures, which is a big task. Our contemporary ventures to lay it down that "a tolerably safe criterion of relative dividend-paying capacity and thrifty capital outlay is afforded by the factor of capital expenditure per unit of output." Doubtless, there is a saving grace in the use, in this connection, of the word "relative;" but people whose money has been sunk in an electric lighting undertaking are even more interested in the "positive" than in the relative dividend-earning capacity of their capital. Thus it is that at Bedford, for instance, where the proportion of capital outlay to units sold is at the distinctly thrifty figure of 4·88s., it still cost £2945 to earn £2908 for the year's working. This only goes to show that the question of the amount of business there is to be done in any locality is at least as important a consideration as the prudent outlay of capital in determining the financial result of the enterprise. We do not find our estimable contemporary lays stress upon this view of the general case for electric lighting, as it is laid before local authorities. Indeed, our friends the electricians are rather shy of drawing inferences from their own statistics. Thus they give up the idea of criticizing revenue accounts, and if they elucidate "the small proportion which the coal bill of an electricity-supply undertaking bears to the total annual outgoings," it is only with the weak purpose of bringing "home to our gas friends our comparative advantageous independence of the ups and downs of the price of coal." Really, the effort is wasted. The "gas friends" know perfectly well that the coal bill is not the most serious element in determining the financial character of any electricity-supply undertaking. The people who appear most in need of instruction upon this head are the local authorities, like the Worcester Corporation and the Shoreditch Vestry, who have been beguiled into believing that the way to fortune in this business lies through "utilizing" water power or the heat of refuse destructors. And they obtained their false notions in this regard from their electrical advisers, who perhaps do not read the "Electrician" so appreciatively as we do.

The article concludes as follows: "When the demand-indicator system, electric traction, and other beneficent influences, have their full effect on the coal bill, it is possible that even engineers' salaries may take a higher rank than coal in relation to the total cost of production. Meanwhile, the remarkable reduction that has been brought about in this once formidable item redounds to the credit of our English electricity-supply station engineers, and of our engineering manufacturing firms." It is elsewhere claimed that "to-day electricity competes with gas from the point of view of cost; and what with penny-in-the-slot meters, demand indicators, free-wiring syndicates, and free lamps, and the coming day load, it bids fair to triumph all along the line." It is easy to write in this vein; but what are the facts corresponding to these suggestions? As shown in the table, the one cardinal essential to the financial success of an electricity-supply undertaking is business—demand. Those ventures that have a good demand prosper, without reference to demand indicators, prepayment meters, free lamps, or anything else besides ordinary administrative capacity and executive faithfulness. Where there is insufficient business, nothing else can bring prosperity to an electricity-supply undertaking. Now, capacity to design an installation thriftily and efficiently, and to manage it properly, is not lacking in the English profession of electrical engineering. At this time of day, a local authority cannot go far astray in seeking technical advice. The authority must depend upon itself, however, and its own commonsense and local knowledge for guidance as to whether it is expedient to undertake electric lighting at all. Purely technical advice is not competent to answer this question; and it is in this regard that wisdom is so often lacking.

Something will be gained, no doubt, if members of local authorities will only give heed to the "Electrician" when it tells them that over all its sixty-two examples "the cost of coal only figures on the average at one-fifth of the total cost of the Board of Trade unit." This is the truth that we have been trying to teach for years, with indifferent success, if the pending case of Gloucester is to be taken as a test. How is it that touting electricians can descend upon a local authority, and delude the members in the way they do? They are not supported by any of the reputable technical journals; yet even these do not denounce the specious "utilization" fallacy as strenuously as their knowledge would warrant. Even now, in the article we have been quoting and discussing it is to be noticed that the writer mentions "electric traction" among "beneficent influences" which may be expected to reduce the coal bill of electric lighting stations. Yet only the other day, with reference to the Glasgow "boundary" dispute, we had Mr. Arthur Wright, of Brighton, laying down the fundamental principle that the municipal supply of electricity for traction purposes could not be made subservient to the lighting branch of the business. So difficult is it to keep a right line in these matters. Meanwhile, let us once more recommend these tables published by the "Electrician" for the uses which they are capable of serving. They tell at a glance, among other things, how in numerous instances capital outlay stands to electricity generated; and, since the average touting electrician usually takes this figure at about half the proper amount, it is a convenience to have at hand the means of correction. Another important fact shown by the tables is the general shirking of depreciation by Municipalities, who are explicitly warned that their sinking-fund payments cannot be considered as adequate provision in this regard. It is worth remembering, after what we had to report concerning Dublin last week, that this mistake first came into notoriety as the "Dublin practice."

THE ENRICHMENT OF COAL GAS.

THE aim of the series of "Notes on the Enrichment of Coal Gas," the publication of which is concluded in another column, has been twofold. Primarily an attempt has been made to ascertain the cost of the enrichment of coal gas in a typical town, accessible to seaborne supplies of Durham coal, cannel, and oil. The degree of enrichment dealt with has been that involved in raising the candle power of ordinary gas from Durham coal to the extent necessary for it to test at least 16 candles uniformly over a tolerably wide distributing area. This is approximately enrichment by two candles, if both enriched and unenriched gas be tested according to the instructions of the Gas Referees of the Metropolis. The attempt to ascertain the cost of such a degree of enrichment by means of various agents, led on naturally to the subsidiary aim of the articles, which was to deduce the relative enrichment values of the several constituents of the enriching gases, the enrichment value of which had been ascertained incidentally in the pursuit of the primary aim of the "Notes." The objects in view were thus: (1) To ascertain the cost of enrichment by the enriching gases at present available; and (2) to ascertain in what constituents of these gases lay their enriching value, with the object of aiding ultimately the production of better gases for the purpose.

The first object clearly was also that of Mr. Holgate, in his paper on "The Enrichment of Coal Gas," to which reference has been frequently made. He dealt with a rather higher degree of enrichment, because he was considering the question in its bearing on the gas supplies of towns of the Midlands and North, rather than of those of the South of England, to which the "Notes" in these pages have more especially referred. The scheme of his paper was an ambitious one; and it may be readily conceded that few gas engineers would have brought it to so happy a consummation. It may appear ungracious to criticize his work, seeing that it has been freely drawn upon for the "Notes" just published; but better than fulsome praise of a really sound paper is the little adverse criticism that can with justice be advanced against it.

Probably Mr. Holgate was not directly responsible for the almost hoary aspect of the paper when it emerged in print in the March "Minutes of Proceedings" of the Institution of Civil Engineers. But it certainly must have exasperated him to observe that benzols were then fetching from 2s. to 3s. per gallon, while he had based his estimates on the price of 1s., which prevailed when the paper was actually compiled. Similarly it failed to take rank as a contribution to current technical literature, because it took no account of Mr. Methven's explicit statement of nine months' earlier date concerning the ratio between the enrichment value and illuminating power of carburetted water gas. With the exception of such shortcomings due to tardy publication, there was only one serious fault in the paper. Unfortunately this fault discounted the value of the comparison of cost of the various enriching agents. Oil was not taken at a uniform price; but in the carburetted water-gas estimate it was charged at a considerably lower figure than in the oil-gas estimates. No more irrational distinction could well have been made; for it will scarcely be contended that oil suitable for the production of carburetted water gas cannot be satisfactorily carbonized in the Peebles oil-gas plant.

Mr. Holgate's estimates of cost had a merit which has often been wanting in similar estimates by some accepted authorities. They were accompanied by full details of the items comprised in them, and thus appeared to court investigation and criticism. As far as possible, his example in this respect has been followed in whatever original estimates have been given in the "Notes on Enrichment" now concluded. A summary of the deductions from the most reliable estimates of the cost of enrichment of coal gas by the various agents appears on p. 897. It brings into bold relief the economy of the carburetted water-gas process when compared with the oil-gas systems. Oil was taken at a uniform cost per gallon for all the processes; and therefore the economy lies solely in the system itself.

The search after the reason of the superior economy of the water-gas process, pertains to the second object of the "Notes." An inquiry into the nature of the enriching gases showed that carburetted water gas was richer than Peebles oil gas in aromatic or benzenoid hydrocarbons. The superiority as illuminating agents of these over the aliphatic hydrocarbons, was demonstrated in a preliminary inquiry into the intrinsic illuminating values of the different hydrocarbons (*ante*, pp. 528, 529). It was also shown that there could be retained by coal gas at low temperatures a sufficient quantity of aromatic hydrocarbons to increase its illuminating power to considerably more than 17 candles. Thus there was no objection to the use of certain

aromatic hydrocarbons—especially benzene—as enriching agents within the range of enrichment under consideration. Therefore the full advantage could be reaped of the superiority of the carburetted water-gas process over the existing oil-gas systems. The same superiority as illuminants of the aromatic or benzenoid over the aliphatic hydrocarbons, was likewise evident in the carburetting fluids. Here, however, the intrinsic superiority was nearly obliterated in practice, through benzol being much more costly than carburine or petroleum spirit. The practical upshot of this portion of the inquiry was that benzol vapour was, for enrichment purposes, worth on the average four times its volume of the aliphatic gases and vapours which are found in enriching gases. In the manufacture of gas from oil or cannel, an advantage can therefore be secured by producing benzene instead of ethylene, &c. The process which gives the greatest yield of benzene will be the most economical, even though the total yield of hydrocarbons be considerably lower than by other systems.

The announcement made in the latest notification of the Metropolitan Gas Referees (*ante*, p. 726), to the effect that "it is the intention of the Gas Referees to make extensive changes in the mode of testing the illuminating power of gas," leaves it very uncertain if the enrichment values now accepted will not shortly need revision. It would be futile to speculate until the actual intention of the Referees is made known. But it may be said that the extent to which questions of enrichment hinge on methods of photometry, does not appear to be sufficiently recognized generally. Should the Referees have decided to permit the rate of consumption of gas under examination to be varied to suit its quality—in compliance with a resolution arrived at by the deputation from the Incorporated Institution of Gas Engineers and the Incorporated Gas Institute which waited upon the last Photometric Committee appointed by the Board of Trade—to the effect "that the rate of consumption of gas to be tested be adjusted as nearly as practicable to the maximum efficiency of the various standard burners"—then it must be confessed that the enrichment values now received will need revision. The London conditions of testing will certainly be followed in other towns where 15 to 17 candle gas is supplied; and a decision of the Gas Referees which permitted a variable rate of consumption, would have an extremely far reaching effect. What is now considered poor gas would, under the changed conditions of testing, appear less poor than it now does; and hence enriching gases would then show a lower duty than they now do. Probably their relative enrichment values would be preserved under the altered conditions; but their absolute values would certainly be much modified. The immense effect on enriching values of a deviation from the uniform 5 cubic feet per hour rate of consumption which is now prescribed by the Gas Referees, was clearly indicated by Mr. Charles Hunt in his letter to the "JOURNAL" for the 28th ult. (*ante*, p. 687.)

THE PETROLEUM INQUIRY.

MENTION has from time to time been made in the columns of the "JOURNAL" of the proceedings of the Select Committee on Petroleum; and we have commented upon the conflicting nature of the evidence offered upon the various points opened for inquiry before the Committee. The commercial and technical importance of the petroleum trade is so great, and growing, that general interest attaches to the investigation. If the inquiry should result in fresh legislation upon the subject, far-reaching disturbance may be caused in a trade with which the gas industry is in touch at both ends—the raw material and the lamp. Gas-works require oil, and the public need light; and if the desires of certain of those who figure most conspicuously in connection with the inception and prosecution of this inquiry are gratified, both the oil and the lamps will be considerably affected by new regulations instituted in the supposed interest of the public safety. The issue of a Blue-book containing the interim report of the Committee, with the minutes of evidence and appendices, supplies a fitting opportunity for reverting to the subject; and we now propose to give an abstract of this valuable official publication, so as to show the drift of the investigation so far as it has proceeded.

The late Mr. Mundella presided at most of the sittings of the Committee. The first witness called was Colonel Sir Vivian Majendie, whose examination is not finished. He handed in a paper relating to several important petroleum accidents which forms the second appendix of the report. The first matter dealt with in this document was the fire and explosion at the Huddersfield depôt of the Anglo-American Oil Company, mentioned in these columns on Aug. 31 last (*ante*, p. 475). Colonel Majendie's statement does not add anything to the available information concerning this accident. He ascribes it "primarily, to the use of a forge in very dangerous proximity to the tank, of which the filling was then going on. But even this recklessness might not have borne fruit if it had not been for the carelessness of the men in allowing the overflow, and perhaps also to the presence of timber in the enclosure; and the mischief was completed by the use of a loose-fitting inlet-pipe and unprotected air-entry." The appendix also describes a serious oil fire which occurred at Glasgow on Jan. 16, in which a considerable quantity of the comparatively high flash-point Scotch paraffin oil was involved. Upon this the Inspector observes: "The fire is interesting as showing that, contrary to the view set forth by some of the witnesses before the Parliamentary Committee on Petroleum of 1876, the risk from paraffin oil when a fire has once been established does not differ appreciably from the risk which exists in the case of any other mineral oil or spirit." The blazing oil ran out from the stores, and turned the street into a "veritable burning lake." Another fire, which might have been more disastrous than it was, took place on the night of Jan. 11, at the Caspian Wharf, Purfleet, where Russian oil was principally stored. This fire originated in a painting-shed, by the ignition of the vapour from an open cask of spirit paint (used in painting the oil-barrels) at the watchman's lamp. This was a very instructive affair; and the Inspector drew several conclusions from the facts. The most important of these is "that, if localized as regards outflow, the danger zone from even a very formidable petroleum fire is a very narrow one, and especially when, as in this case, adequate appliances and trained workmen are at hand to assist in such localization, which (and not the extinction of the fire) should be the point aimed at in all such cases." Upon the premises were two tanks each containing 4500 barrels of high-test distillate for making gas. This oil had a specific gravity of ·867, and a flash-point of 197° Abel. The tanks were not affected, though one of them was only 20 feet, and the other 30 feet from the burning shed.

The first witness to be completely examined was Mr. Isaac J. Collins, who was associated with the late Mr. A. M. Silber, the inventor of the well-known lamp that bears his name. Mr. Collins was in favour of lamp-oil of great specific gravity and high flash-point, to approximate to the old colza oil character. He thought that after this the construction of a practically unbreakable lamp, to retail for 1s., would solve the whole problem of the safe use of mineral oil for lighting. The next witness was Mr. R. Norman, of Epsom, a dealer in oil and lamps. During his twenty-five years' experience in the retail trade, commencing with the sale of Scotch paraffin oil and going on with the American product, the witness had never had an accident to the person or to property. There had been minor fires, due to dirty lamps and ill-fitting wicks; but, in witness's opinion, "if you have a properly fitting wick with a properly constructed burner, and with a properly constructed lamp, you may burn almost anything." The whole of this witness's evidence is extremely interesting, and the information he was able to give at first hand respecting the distribution and popular use of oil and lamps appears to have considerably impressed the Committee, who asked him many questions.

After the retailer, very appropriately came the Coroner, Mr. A. Braxton Hicks, who tendered evidence in his capacity as the Honorary Secretary of the Coroners' Society for England and Wales. This Society, of gruesome suggestiveness of title, had considered the subject of lamp accidents, and concluded that, apart from the vexed question of the flash-point of the oil, the character of the lamps now commonly sold is the cause of the majority of fatal lamp accidents. The Society suggested "that some inquiry should be made as to what class of lamps should be sold in the kingdom, having regard to public safety; and, further, that none should be allowed to be sold unless they came up to such standard as required under regulations of the Home Office." This witness produced a detailed list of lamp accidents, compiled from information supplied by Coroners, for the years 1894 and 1895. The list is the first appendix of the report. It includes 149 fatal cases for all England outside the Metropolitan area. In the County of London, 26 fatalities occurred in 1896. The Committee went closely into the particulars; and the gist of the result seems to be indicated in question No. 468 (Mr. Jesse Collings): "Speaking of the number of accidents, looking at the enormous number of lamps used, the millions of lamps used under every conceivable circumstance, are you surprised that there are not more accidents than those you refer to, or do you think that the number is larger than it should be?" The answer was: "I think the number is larger than it should be; but, considering the rubbish that is put upon the market, it is somewhat surprising that there are not more." The witness refused to express an opinion as to the flash-point of the oil.

It is worth while to follow the example of the Committee, and look closely into the particulars of lamp fatalities furnished by the Coroners; for in them we have for the first time the solid facts upon which the imputation of deadliness has been fastened in regard to mineral-oil lamps. It is not without reason that the Coroner declined to consider that the character of the oil had much, if anything, to do with these accidents. Most of them are cases of upsetting or dropping lamps while alight; and in many the immediate cause of death was "clothes set on fire." Some lamps exploded, after a long period of burning, by the users blowing down the chimney. On the whole, Mr. Braxton Hicks appears to be justified in saying that, so far as Coroners and their juries are concerned, the question of the flash-point of the oil does not matter, "because if a person drops a lamp down, or it explodes, the flashing-point does not come in." Unquestionably, on the face of the returns, many of the fatal accidents recorded might not have happened if the lamps themselves had been of stronger or better construction. Yet, after all, of the 149 fatal accidents with lamps that represented the Coroners' crop for two years, some must have

occurred with any make of lamp and any kind of oil. "Fell down stairs and broke lamp;" "upset tin hanging lamp and received burns;" "pulled off table and broken;" "turned wick into oil, and lamp exploded." The list is not so very alarming, when read in the light of the facts recalled by the question of Mr. Jesse Collings.

Mr. T. Jones, a lamp and oil dealer of Walthamstow, whose trade is exclusively with the industrial classes, has intelligence of perhaps twenty lamp accidents a year, nearly the whole of which are due to carelessness, with a few pure accidents, such as lamps being knocked over. "The instances of lamps which ought not to be in use are very few." Danger is occasionally incurred through the makeshift devices that people employ when anything has gone wrong, and cannot be properly remedied (say) until next morning. This, of course, has nothing to do with the oil. The witness sells exclusively American oil; and he thinks that, with well-made burners and substantial oil reservoirs, there is no danger in using the American oils. He also said that there are about 124 different kinds of lamps and burners in the market; so that it is difficult to make a selection to be imposed upon the public as absolutely the fittest. So-called "safety" lamps, he thought, were "about the worst type of lamps ever invented." With regard to the oil, the witness preserved an open mind. He preferred the high-flash American oil to the Scotch, which he formerly sold, on account of its superior cleanliness and freedom from smell; but the public chose the lower-priced and low flash-point oil. Russian oil did not suit his customers.

An important trade witness was Mr. Solomon Falk, of Messrs. Falk, Stadelmann, and Co., Limited, who testified that his firm turned out, roughly speaking, 750,000 lamp-burners last year. The witness gave it as his estimate that there are 10 million oil lamps and stoves sold in the United Kingdom every year—an enormously high figure, we should think, having regard to the population. Mr. Falk spoke with most force on the construction of lamps. He altogether disagreed with the suggestion that glass containers ought to be abolished, but admitted that they ought to be made stronger. It was stated that in Scotland and the North of England metal containers will not sell at all. The witness gave, as the recommendation of the Lamp Trade Association, the simple rule that the weight of glass oil-containers should be 1 lb. to the pint. He also objected to wick-tubes as an element in safe lamp construction. He did not see how this could be secured by legislation, because lamps are made up of different parts of various origin. Mr. Falk was in favour of compulsorily raising the flash-point of lamp oil; but he did not seem able to satisfy the Committee that he spoke from anything but hearsay on this aspect of the problem. The Committee examined the witness closely on this point, apparently in order to ascertain whether the lamp manufacturers wish for a so-called safe oil with a view of having greater liberty in the making of cheap and flimsy lamps. A retailer from Clapton made a small diversion by praising Russian oil to the disadvantage of American, and claiming that the "penny lamp," condemned by previous witnesses, is "one of the safest little lamps made."

Mr. R. Price is an ex-Inspector of Petroleum for Birmingham, which position he occupied for ten years. During this time there was not a single fatal lamp accident, but numerous fires and minor troubles. The chief cause of these accidents was the lamp breaking through being upset, generally after it had been alight for some time. Carelessness in trimming was another prolific cause of accidents. The witness thought that metal containers are generally made too thin, when they are more dangerous than glass. Mr. R. Morton, a Scotch ironmonger, testified that most lamps offered for sale are safe enough if kept clean and used as they should be. Mr. W. Smith, of Liverpool, agreed that the chief cause of lamp accidents is ignorance and lack of care and cleanliness on the part of users. Mr. R. Bruce, a licensed hawker of lamp oil, doing an extensive business in Newcastle, gave some particulars of the trade; and he was followed by other dealers. This concluded the evidence relating to the vending of oil in small quantities.

The evidence given by other witnesses will be dealt with in subsequent articles.

THE LONDON WATER ACTS OF 1897.

In the two preceding issues of the "Journal" the Water Acts of the past session relating to provincial towns have been noticed. The following Acts represent the legislation in regard to the water supply of London.

The East London Water-Works Act authorizes the construction by the Company of two additional storage reservoirs at Tottenham (partly situated also in the parishes of Edmonton, Walthamstow, and Chingford), with the necessary subsidiary works. The Company engage to give the Tottenham Urban District Council 25 acres of land for a recreation-ground. About 100 acres of common or commonable lands at Chingford and Tottenham are to be taken. Portions only of certain buildings and property may be taken by the Company. The lands are to be acquired within three years, and the works constructed within seven years. Clauses are inserted for the protection of the Lee Valley Drainage Commissioners, the New River Company, and other property owners. Power is given to the Company to enter into agreements with other London Water Companies for mutual assistance, subject to conditions. Debenture stock to the amount of £500,000 may be issued by the Company, subject to redemption at par after twenty-five years. The following provision is made for the creation of a sinking fund: At the end of the half year during which the new works shall be brought into use, the Company are to carry to a sinking fund in each year such percentage on such amount of debenture stock then issued under the Act, and certified by the Auditor to have been issued and applied for the purposes of the works in question, and any premiums received thereon, as shall be equal to the excess of the average percentage of the dividend or interest paid for that year on all the capital of the Company, whether ordinary or debenture stock, with any premiums received thereon above the rate of interest at which debenture stock under the Act was issued, together with an additional 1 per cent. added thereto for management. This sinking fund, as in the case of other Companies, is to be held and applied by the Chamberlain of the City of London as trustee for the extinction of the Company's capital. In the event of the Company's undertaking being acquired by a public authority, the allowance of 1 per cent. for management is not to be the subject of compensation or purchase. The new capital is to be applied as follows: £342,000 for reservoirs and conduits; £48,000 for a new distributing main; £40,000 for additional engine power and machinery; £60,000 for extension of mains and services and the costs of the Act.

The New River Company's Act authorizes the construction of an aqueduct or pipe-line, subsiding reservoirs, a pumping-station at Kempton Park, and other works, with the object of enabling the Company to obtain directly their own proportion of the stored water under the Staines Reservoirs Act of 1896. Provision is made for the protection of the other parties to this arrangement. The Gaslight and Coke Company have procured the insertion of stringent clauses protecting their mains. These require the Water Company to give fourteen days' notice of any works likely to interfere with the gas-mains, and prescribe the manner in which the works are to be carried out. If the supply of gas is interrupted by the works, a forfeiture of £10 per hour is to be incurred; and all expenses and risks of every kind are to be borne by the Water Company. Railways, canals, and roads and bridges are also safeguarded in the usual way. No solid matter is to be discharged into the River Thames. The works are to be completed within fifteen years. Redeemable debenture stock to the amount of £1,000,000 may be created, and issued at such rate of interest as in the opinion of the Governor of the Bank of England shall be best calculated to secure its being taken up at par. A sinking fund is to be established as in the foregoing Act.

The Southwark and Vauxhall Water Act rehearses that since 1852 the Company have had statutory authority for the taking of water from the River Thames below Teddington Lock. The Conservators in January last obtained an injunction restraining the Company from abstracting from the river a greater quantity of water than 24½ million gallons in every 24 hours. The Company continued to draw water from the river in excess of this amount, and sought to be authorized to continue doing so temporarily, and without prejudice to any other question. The Act enables the Company to take such quantity of water from the river, whether or not in excess of 24½ million gallons per day, as they may require for the purpose of fulfilling their statutory obligations. It is provided that the Company shall not take more than an aggregate quantity of 45 million gallons per day calculated over the number of days in the half year. Nor shall they take more than 24½ million gallons in any day when the flow of water over the new weir at Penton Hook is less than 300 million gallons, or 265 million gallons at Bell Weir. It is provided further that the Company may only take the excess quantity flowing at these places when the minimun is exceeded. The concurrent rights of the other Water Companies are protected. Certain payments are to be made by the Company to the Conservators in respect of any excess water taken under the Act. The Company must introduce next session a Bill for power to obtain land and construct within eight years such storage reservoirs and other works as may be necessary to enable them to fulfil their statutory obligations. The present Act is to be repealed by the passing of the Bill, and in no case is to remain in force after Sept. 1, 1899. Within one month after the passing of the Act, the Company are to make good all their mains in Hampton and Hampton Wick, and put the roads in good repair.

American Gaslight Association.—In addition to the papers already mentioned as being in the programme for the annual meeting of the American Gaslight Association, which was held at Old Point Comfort (Va.) last week, the following were announced in the "American Gaslight Journal" for the 11th inst.: "Why not a Quadruplex Purifying-Box?" by Mr. F. H. Shelton, of Chicago; and "Iron Rust in House Pipes," by Mr. F. B. Wheeler, of Long Branch (N.J.). The following subjects were submitted as suitable for discussion by means of short written introductions: "Notes on Main-Pipe Laying," "Leakage," "An Experience in Oil Storage," and "How to Extend the Use of Gas for Culinary Purposes beyond the Heated Season." Other topics were to be suggested through the "Question-Box."

NOTES.

The Cleaning of Structural Ironwork.

A description is given in the "Engineering Record" of an interesting operation now being conducted by the Department of Public Works of the City of New York, under the direction of Mr. E. P. North, Consulting Engineer to the department, and under the direct supervision of his assistant, Mr. M. E. Evans. This is the thorough cleansing and renovation of a long and heavy steel lattice girder viaduct carrying a wide carriage road and two sidewalks. It was built four years ago, and at one point it just clears the chimneys of the locomotives of the Elevated Railway, which subject it hundreds of times daily to the severest possible treatment from their smoke, gas, steam, and acid products of combustion. The result has been that the usual painting has been of no service in preserving the structure. Previously, though the remains of the old paint were removed as thoroughly as possible by the usual method of wire brushing and scraping, the new coats could not be made to adhere or endure satisfactorily. It was consequently determined to apply the sand-blast to clean the work. The part of the viaduct to be operated upon is tightly enclosed by a wood and canvas chamber, inside which the air is full of sand and dust. Compressed air is delivered to sand-mixers; and the cleansing stream of sand and air is delivered through flexible pipes and nozzles. About $\frac{1}{3}$ cubic foot of sharp silica sand is required to clean a square foot of iron surface; the same sand being used four times over, when it is too fine for further use, and is thrown away. The cleaners work in helmets; and they can clean about 80 square feet of large plane surface an hour with one nozzle. The custom is for the cleaners to work from 6 a.m. to 3 p.m., when they knock off and are immediately followed by the painters—the clean surface rusting very quickly. Before the sand-blast was applied, the work was treated to a preliminary air-blast which in four days blew off 12 tons of scale, cinders, loose paint, and dirt from 12,000 square feet of surface. Mr. Evans estimates that ordinary structural ironwork, as a large viaduct, could be cleaned by this process for a total cost of about $7\frac{1}{2}$ c. per square foot, including scaffolding. It is to be trusted that our American contemporary will give full particulars of the effect of the new painting.

The Manchester Sewage Question.

The condition of the Manchester sewage question is not creditable to contemporary sanitary science. The Corporation are threatened with legal pains and penalties for turning the sewage of the city and district into the Ship Canal; and they do not know what else to do with it, short of constructing a drainage culvert 16 miles long, at an estimated cost of £258,000 exclusive of extras, which would certainly be heavy. It appears to be assumed by the Corporation and their advisers that the best preliminary treatment of the sewage is precipitation by milk of lime and copperas. Then arises the question of the disposal of the tank effluents, which is stated by Mr. T. De Courcy Meade, the City Engineer, as possible of solution in three ways. These are: (1) Natural filtration through land; (2) artificial filtration; (3) removal to tidal waters by a culvert. The last, which has the approval of Sir H. Roscoe, Sir B. Baker, and Mr. J. Mansergh, is a confession of the failure of science to purify town sewage efficiently and economically. A good deal has been heard lately of the filtration of sewage by means of coke breeze; but it is estimated that to treat the sewage of Manchester in this way would cost half as much again as land treatment, and double the price of a culvert. Meanwhile, it is certain that the culvert scheme would be strongly opposed by the estuarine districts affected. For several reasons, notwithstanding its supposed excessive cost, the method of artificial filtration commends itself as likely to prove the most satisfactory in the long run; but too little experience has been had of works of the kind on the scale required by Manchester, to warrant the formation of definite conclusions respecting the principle.

The British Association and Tramway Traction.

Not much of general engineering interest transpired at the Toronto meeting of the British Association; but, according to the abstract of the proceedings of the Mechanical Science Section prepared for "Nature," one of the most important subjects treated was American practice in tramway working. It is recorded here as the general opinion of all the electrical engineers, both British and American, who discussed the subject, that for smaller towns with comparatively uncrowded streets, and for the outlying roads of great cities, especially those extending into residential suburbs, the overhead trolley system is, at any rate at present, the only really practical method. For the main business streets of great cities, however, if street tramways are permissible at all in such thoroughfares—a doubtful point—some system which requires neither overhead wire nor underground conduit seems the ideal. At present, no satisfactory electrical system of the kind has been brought into use. The reporter for "Nature" overlooks the fact that both gas and compressed air power tramcars exist and present at least the potentiality of fulfilling this requirement. He rightly condemns the old system of horse haulage; but his conclusion that, where tramcars can be run at all, they should be worked by the overhead trolley wire, is not to be accepted without reserve, though the system has much to recommend it, and the objection to it on the score of its ugliness does not apply in very many localities.

COMMUNICATED ARTICLE.

SUGGESTED EXAMINATIONS IN GAS DISTRIBUTION.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

The letter from "Fitter" recently published in these columns (*ante*, p. 688), advocating the claims of gas distribution on the consumer's side of the meter to be considered as a distinct trade and recognized as such in Technological Examinations, touches upon a very important subject; and I venture to say there are few engineers or managers of gas-works who would not cordially support the suggestion therein contained, and hope it may attract attention in authoritative quarters. Gas is now so generally applied—and that not only for lighting, but also for warming, cooking, and many other purposes—that the work which falls to the lot of the gas-fitter in connection with a newly-erected building is quite as important as that apportioned to the paperhanger or the plumber.

On behalf of the health and comfort of future occupants it is most desirable that the water-pipes, drains, and cisterns should be properly set and connected; and the existence of a law to the effect that these appliances should be subject to inspection by a competent official, such as now applies in several towns, is to be hailed as a wise regulation that should be generally adopted throughout the length and breadth of the country. But it is equally important that the pipes and accessories for the supply and consumption of gas should be rightly proportioned and fixed, and subject to competent inspection in an equal degree. In fact, inspection is more necessary in the case of the gas-fittings, for the whole of the plumbing work can be previously designed in every detail. Sanitary science is such a prominent subject that one can scarcely join a party at dinner without hearing some conversation on the subject of infectious diseases, or being solemnly warned to avoid certain viands that are popularly reported to afford accommodation for germs of disease and destruction. Therefore, every architect, if he values his connection, has to give particular attention to the drains and the water-supply arrangements; and so it rarely happens that any important part of the design is left to the discretion of the plumber. But the case is different with regard to the gas-fittings. The gas-fitter is not furnished with a complete specification. A plan of the pipes, and the sizes to be used, may perhaps be supplied; but even this may be worse than useless, for the simple reason that, whereas the consumption of water, &c., will be fairly regular according to the number of occupants, the tenant may require anything between a gas-jet here and there, and lights in every room—and not only lights, but also other appliances, such as gas-fires, bath-heaters, and cooking-stoves. A great deal is thus left to the discretion or judgment of the gas-fitter; and he may be called upon to lay out the whole design, being told no more than the bare requirements in the way of lights or stoves. This he proceeds to do in a more or less perfunctory or rule-of-thumb kind of way, having received no training that will qualify him for a proper discharge of such an important duty, and therefore depending upon the information that he has gathered in the course of his daily practice. But this is not a sufficient guide, as the sizes of gas-pipes to be laid throughout a building, or for the supply of a stove or engine, cannot be accurately determined or laid out without a knowledge of the principles concerned in the flow of gas through pipes, the use of the pressure-gauge, and the properties of gas itself, together with some idea of geometry and drawing to scale. I do not blame the gas-fitter. He is quite as good a craftsman as the bricklayer or the carpenter, who would get into similar difficulties if left to work under the same conditions. Sometimes there is a little too much made of the "ignorance" of the workman; but the man himself is not actually at fault. It is the want of system, and absence of proper supervision. The troubles that are usually ascribed to the ignorance of the fitter should really be traced home to someone higher in authority. In fact, the average gas-fitter is an intelligent and handy workman, who has made the best of such small opportunities as fall to his lot, and manages to carry out work of the kind to which he is accustomed in a manner that leaves nothing to be desired. The complaints that arise by reason of defects between the meter and the burner are not numerous, and are far less common than was formerly the case. So, instead of labelling the gas-fitter as ignorant and stupid, because he makes a mistake occasionally, I am inclined to compliment him on the fact that complaints are not more common. The troubles that do arise can usually be traced to the gas-fitter having had no training upon the points above referred to; nor has he had the opportunity of getting it. But the continual introduction of new appliances increases and emphasizes the need that the education of the gas-fitter should be put upon a proper basis, and be extended to cover the whole of the duties he is called upon to discharge. At present he is simply taught the practical part—such as how to cut a thread or blow a joint—and is left to pick up the remainder how and where he can.

Commencing with the introduction of gas, the scope of the duties that fall to the lot of the gas-fitter has been continually spreading and enlarging, keeping pace with the increasing demand for gas; and in no way could the large extent of the

field covered by the gas industry be better illustrated than by tracing the gradual development of these duties. Going back about fifty years, we find that the staff of the ordinary provincial gas-works included men who laid mains and services, fixed meters, and perhaps followed up the completion of the whole right through to the burner. As the undertaking increased, this department was gradually classified and divided into main-layers, who put down cast-iron work; service-layers, who laid wrought-iron pipes; and meter-fixers, who worked in compo., and used the blowpipe or soldering-iron. The internal fittings fell to the share of the latter class; and at first these were of a very simple character, including pendants, brackets, and water-slides, about three sizes of pipe, and two or three different sizes of batwing and fishtail burners. He worked under the general supervision of the manager. The tradesman's gas-fitter was a man of similar stamp, who had learnt to blow joints and screw pipe; and if his firm had a sufficient connection, he made a speciality of gas-fitting, and confined himself exclusively to this kind of work. In most cases, however, he filled up his time with plumbing or painting, or some branch of the building trade. But compare this simple state of things with the requirements of the present day. A competent gas-fitter must now have a knowledge of a great many different kinds of lighting burners, including the flat-flame, incandescent, and regenerator patterns; he must understand pressure-regulators, cooking and heating stoves, and a large variety of appliances for special purposes, gas-engines, and so on; and he will be called upon to deal with questions of heating and ventilation. Mere constructive knowledge is therefore not sufficient. He may be able to make a stove from beginning to end; but that is not enough, in the absence of any acquaintance with the quantity or quality of gas required, of air supply, or of products of combustion. Indeed, many makers or designers of gas appliances would be greatly aided if better posted on these points.

The present occasion is by no means the first recognition of this deficiency. Among other endeavours that have been made to meet it may be mentioned the excellent little handbooks issued by Messrs. J. Wright & Co., Mr. Thomas Fletcher, and Mr. William Sugg, in which the particular details that "Fitter" has in view are set forth in simple, popular language, well within the comprehension of the hypothetical intelligent workman who so often figures in connection with patent-law cases. And it is not too much to say that the efforts of these gentlemen have been the means of doing, in a quiet, unobtrusive way, a great deal towards the education of the individual now in view. I have found that a copy of one or other of these works is always well received and perused by the fitters. The report of the Crystal Palace Gas and Electric Exhibition contains a great deal of useful information, but in rather too elaborate a form for the object now under consideration. A simplified abstract or compendium of the principal factors would, however, be very useful. This report was followed by similar productions on a less extensive scale; and the subject has also been frequently referred to at meetings of gas managers. Any steady persevering young man who has attended practical classes on plumbing, or otherwise acquired a knowledge of the practical or handicraft part, can therefore improve himself as regards the remainder by a careful study of as many of these books as he can obtain access to. Every gas manager can thus do something in the way of encouraging and assisting gas-fitters to rise to the dignity of their calling, and to become thoroughly qualified in the same. In large towns, where a considerable number of men are employed as gas-fitters, a good plan would be for the gas company to arrange for the delivery of a series of lectures "for gas-fitters only," at which the various points relating to the flow of gas in pipes, the supply pressure in connection with burners of all kinds, the explosive and other properties of gas, the construction of meters and recording pressure-registers, &c., could be popularly demonstrated with models, drawings, and experiments. This would be rather for the benefit of the existing generation, and is an addition to, and not a substitute for, the classes and examinations for the use of the student.

Perhaps the chief defects in connection with the gas-fitter are his loose ideas on the subject of supply pressure and of meters. The recording pressure-register is now so cheap and portable that it may well replace the ordinary pressure-gauge, which gives a momentary indication of the amount of pressure, but does not take in the exigencies of the whole 24 hours, or of different seasons of the year. It is all very well to know that there was 10-10ths pressure at one time, and 12-10ths at another; but unless intelligently read in connection with the conditions of consumption—not only on the premises in question, but also in the immediate neighbourhood—there is no idea of the variations that may occur at other hours or periods. But a 24-hour diagram, taken on the heaviest consumption, or a few representing different days of the week, furnishes written evidence that can be laid by for reference, and taken out and studied at any time, and is of a kind far superior to that obtained by inquiry or by momentary tests. The man who is acquainted with and has studied such diagrams has an insight into the exigencies of gas supply that he could not obtain in any other way; and, in passing, it may be remarked that a set of these diagrams, covering the chief streets of the district, and arranged in methodical order, is a very useful article at the gas-works. The remarks on this head apply with equal force to the control of the pressure at the gas-works. As to meters, it is a case of loading the willing horse. No attention is paid to the sizes or capacities; and the meter is not changed for a larger one until shortage of supply, or some other marked defect, causes it to be absolutely necessary. Because the meter will stand a great deal, and pass two or three times the quantity indicated on the face-plate as its proper capacity, the nominal size is entirely neglected; and a 3-light meter is loaded up with nine to twelve burners, and other sizes in proportion. The fact that this excess of duty is obtained at the expense of reliability and steadiness of supply is not appreciated; and when the overworked machine suddenly sticks fast, and puts the premises in darkness, the inconvenience is accepted as an unavoidable nuisance. The variations of pressure due to working the meter rapidly are apt to be more noticeable with incandescent than with flat-flame burners; and a similar mistake has been made with gas-engines. Because in a weak moment authoritative statements have been made that a gas-engine will work up to double its normal capacity, many people suppose that twice the stated horse power is a fair mean working capacity. Thus, we frequently find gas-engines fitted with meters and supply-pipes barely sufficient for the normal rate, which are expected to run double power for hours together. Double normal power means at least twice the normal consumption of gas; and the meter and service should be arranged for this quantity. Another disadvantage arising from taking the maximum as a fair working mean is the fact that the machine is in such a strained condition that a straw suffices to bring it up dead. In this way, there are frequent stoppages, which are very vexatious, and perhaps cause a great deal of loss or expense. The gas-fitter is sent for, and, being unable to explain the matter, he falls back on the usual last resort—"It must be the quality of the gas." A sharp letter is then received at the gas office, demanding more pressure or better gas, and threatening damages.

The gas-fitter should be able to explain these matters—in relation to engines, meters, or pressure—fairly and squarely to the customer, and especially to point out the disadvantages of overloading meters, engines, or anything else, and that pressure is not a matter for personal opinion or circumstantial evidence, being capable of positive proof by the aid of the recording pressure-register.

As to existing methods, it is indeed a case of taking a steam-hammer to crack an egg, when the student is advised to avail himself of the examinations in gas manufacture. He can qualify for the work of distribution without knowing how to design a stage retort-house, or being prepared to state the advantages of inclined as compared with horizontal retorts, or differentiate between coal, water, and oil gas; and the list of preparatory subjects recommended to the student of gas manufacture, comprising mathematics, geology, and drawing office and laboratory practice, is rather a staggerer for the young artizan. But, even if he mastered the whole of the difficulties, he might after all come out with a mere cursory acquaintance with some of the topics actually wanted, though qualified for a chair at a college in other respects. As may be seen by looking over the contents of the little books I have mentioned, a much simpler course would answer every purpose; and the whole matter could be dealt with in one season, or at most two. If a young man of ordinary ability and education began at once to attend two evening classes per week—one for the handicraft work, and the other for dealing with the subjects necessary to a proper knowledge of gas distribution—there is no reason why he should not be able to take his gas-fitter's certificate next May.

I have kept to the expression "gas-fitter" in the usual acceptation of the word; but there is room for a new term that would indicate a person competent to deal with everything between the meter and the burner. This, however, is entering upon the large question of our system, or, rather, want of system, in regard to technical nomenclature generally. The young child describes a horse as a "gallopper," and a steam-engine as a "puffer;" and this primitive plan has been followed in the naming of gas apparatus and gas workers. Such expressions as "hydraulic main," "scrubber," "exhauster," "inspector," and "fitter" are simply distinctive terms, that in course of time acquire a certain meaning in the profession; but they are not intelligible to outsiders. But, beyond mentioning this matter, I do not propose to go. It is a bad thing to take out a patent, worse to write a book, and most atrocious to compile a technical index; but words fail to describe the inventor of a new word.

Institution of Junior Engineers.—The annual general meeting of this Institution, of which Mr. Walter T. Dunn, the Secretary of The Gas Institute, is Secretary, was held last Friday. The Council stated in their report that at the end of the sixteenth session the number of names on the register was 480, as compared with 454 at the end of the previous session. The receipts for the year amounted to £531, and the expenditure to £543. The Chairman (Mr. H. B. Vorley), in moving the adoption of the report, said the Institution was primarily an educational body. It endeavoured to cover the whole field of engineering; and this it accomplished by means of lectures, &c., and by organizing visits to works. The report was adopted. The officers for the ensuing year were afterwards elected. It was announced that Mr. J. A. F. Aspinall has been elected President, in succession to Sir A. R. Binnie.

TECHNICAL RECORD.

NEW STOKING MACHINERY AT THE BURY CORPORATION GAS-WORKS.

A Visit of Inspection by the Gas Committee.

The Corporation of Bury have for some years been in the front rank with several other Corporations and Gas Companies who have distinguished themselves by fitting up their works with the most modern labour-saving appliances; and a visit to the gas-works of the Bury Corporation would reveal the fact that the machinery for saving labour—as applied to the coal stores, retort-house, and coke-yard—is most complete, and of exceptional character. Seeing that the price of gas at Bury is only 2s. 3d. per 1000 cubic feet, with 1d. discount for payment within 21 days, notwithstanding that the Corporation are handicapped by their sinking fund, &c., to the extent of 8·7d. per 1000 feet, the working results, it must be admitted, have been most satisfactory. So successful have they proved that no extensions in the works' plant have of late years been made without arranging for further labour-saving machinery; and the Gas Committee certainly have cause to-day to congratulate themselves and their Engineer and Manager, Mr. W. H. S. Gendall, for their foresight in this direction. In other ways the works are kept well to the front, as is shown by the fact that there is a tar distilling plant in operation, as well as plant for making concentrated ammonia liquor as an addition to the sulphate apparatus.

Last Wednesday an opportunity was afforded of paying a visit to the works, on the occasion of the official inspection by the Gas Committee of the new stoking machinery, driven by compressed air, recently fitted to one section of the retort-house by West's Gas Improvement Company, Limited, of Manchester, who have manufactured and erected the whole of the coal-handling machinery for the coal-stores and retort-house, the stoking machinery, the coke elevator and conveyors, coke storage hoppers, and other appliances in connection.

The coal comes into the works by a railway on the ground level; and the waggons, after being detached from the engine, are brought alongside the end of the coal-store by means of a steam-driven capstan. Hoisting machinery raises the waggons at one end until the coal is delivered out at the other into a large hopper placed over a coal-breaker, which reduces the coal to a size suitable for being raised by an elevator to a band conveyor situated in the roof of the store, and extending the whole length of the building, which is about 300 feet long. The coal is, therefore, distributed mechanically in any part of the store as desired, but chiefly to a point from which it will gravitate to the coal breakers, elevators, and conveyors, for supplying the retort-house and stoking machinery.

The retort-house is in two sections—one section having been worked for some years by West's manual charging and drawing machines, supplied with coal by a system of coal breaker, elevator, and conveyors, which not only served the retorts worked by the manual machinery, but conveyed coal to the retorts in the other section of the retort-house, until recently worked by ordinary hand stoking. The improvements lately made in this latter section of the retort-house chiefly consist in the addition of retort-benches heated by regenerator furnaces, and an additional stage-floor in connection with same, together with the raising of the overhead coal conveyors and hoppers to suit the machinery. In addition to this, a new coal-breaker has been fixed, together with an elevator, so as to act as a duplicate to the existing machinery, which has now done service for some years. There is also a conveyor extending from the overhead coal-conveyor which fills the coal-store, so that coal may be taken direct from this conveyor to the system of conveyors leading to the overhead hoppers for storing the coal ready for supplying the charging machines in both sections of the retort-house. West's compressed air system of charging and drawing has been applied to the new retort-benches; and the following is a description of the several parts of the apparatus, apart from the coaling machinery already mentioned.

The charging machines are fitted with propelling gear, for travelling along the retort-house on lines laid parallel with the retort-stacks. Each machine carries a supply of coal in an adjustable hopper supported by chains from the top of the frame; and the hopper can be raised or lowered to suit the various tiers of retorts by means of gearing worked by the motor that propels the machine. The hopper on each machine, for carrying the supply of coal for the charger, is provided with a feeder-box controlled by a hand-wheel for regulating the amount of the charge. The charger, which enters the retorts with the coal, is carried in a frame suspended below the hopper, and is driven in and out of the retort by a compressed air-cylinder, rack-and-pinion, chain drums, and chains. The charger, which has all the movements for charging the retorts protected from coal-dust by a cover, consists of a scoop and carriage containing the mechanism for emptying the coal out of the scoop and righting it for a fresh supply. It is also arranged that the scoop shall enter the retort twice in order to make a complete charge—first turning over in one direction, and then in the other, so as to throw the coal towards the right and left hand sides of the retort respectively. The scoop is entirely suspended by its carriage, and does not at any time during its travel rest on the retort.

The drawing machines are fitted with a motor and travelling gear; also with gear for hoisting and lowering the rake-bar to the several tiers of retorts. The machine is fitted with an automatic controlling arrangement for the air-cylinder; and the rake-head is driven into and out of the retort by chains connected to a rack-and-pinion worked by the air-cylinder. It is fully under the control of the attendant, who also can raise or depress the rake-head over or into the coke by means of a hand lever. A tank containing water is carried on each machine, for the purpose of cooling the rake-head.

Both the charging and the drawing machines are worked by compressed air supplied by an air compressor fixed in a building outside the retort-house. This air compressor has every improvement embodied in it that can be devised for compressing air with the smallest possible expenditure of steam. The type of compressor at these works is that known as the "single line," in which the air-cylinders are tandem with the steam-cylinder. The steam-cylinder is steam jacketed and lagged; and all the bearings are of extra proportions, to minimize the wear and tear and the repairs under the conditions of running night and day. The air-cylinders are of two sizes, and do the work of compression in two stages. Between the stages, there is a cooler, to take out the heat developed by the compression in the low-pressure cylinder. In addition to these, each cylinder is provided with a jacket supplied with water for cooling. The suction and delivery valves have a positive action controlled by cams on a revolving shaft; so that the valves may have large areas and wide openings to prevent wire-drawing and friction of the air, and yet be well under control, to prevent detrimental shocks. The compressor is fitted with an automatic arrangement for reducing the speed of the engine when the compressed air in the receiver has attained its maximum working pressure, and for re-starting the engine at its full speed as soon as the pressure falls.

After the air is compressed, it is delivered into and stored in a cylindrical receiver, to which are attached the pipes leading to the retort-house. The air is conveyed from the receiver by iron pipes to the hose drums, fitted to the girders carrying the overhead coal-hoppers for supplying the charging machines with coal. There is a large hose drum, complete with all fittings, for each of the charging and drawing machines. A long length of flexible hose is attached to each of these drums at one end, and at the other end to the machine, which is supplied from it. Each drum is provided with a hollow shaft through which the air is supplied; and, by an arrangement of gun-metal swivel joints, the air is supplied to the hose on the drums while they revolve. On each hose-drum shaft a chain drum is keyed; and a chain attached to this leads over pulleys fixed in the retort-house roof, having weights at the other end which rise and fall as the hose is automatically paid out and in by the machines. The hose leading from the drums to the machines is specially constructed for conveying air, and is supported at intervals by suspending brackets and rollers, so that the strain on it is very light.

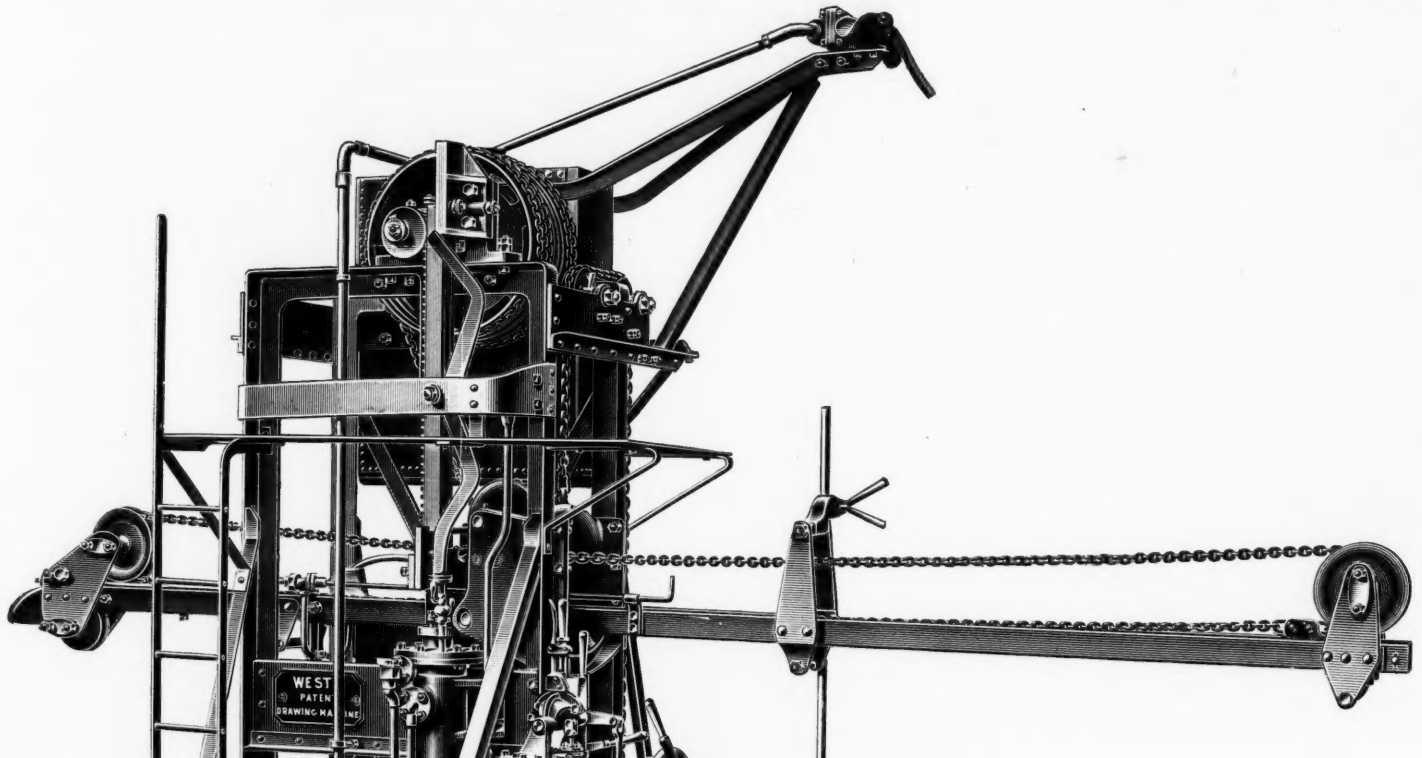
As a supplement to to-day's issue of the "JOURNAL," we give illustrations of the air-compressor and the charging and drawing machines. They are of interest as being the most perfect examples of this type of machinery so far erected, and are the results of many years' practical experience in the successful manufacture and introduction of stoking machinery by West's Gas Improvement Company.

The coke-handling plant at the works calls for some comment, as it has been designed to meet the circumstance that the coke-yard is situated at some distance from the retort-house; the exhauster and boiler house, the purifier-house, and other buildings, being in between the retort-house and coke-yard. The arrangements that have been at work here for several years in connection with the elevating of the coke from the retort-house, conveying and storing it in overhead hoppers having outlets for filling carts when underneath, or for conveying the coke to the yard and storing it there, have admirably met the necessary conditions.

The Committee of Inspection included the Chairman, Mr. Councillor Byrom, J.P., the Deputy-Chairman, Mr. Councillor T. S. Collinge, J.P., and the following members of the Gas Committee: Aldermen Hardman, Meadowcroft, and Peel, and Councillors Bentley, Butcher, Dr. Mellor, Turner, and Wilson. Mr. Gendall was, of course, present to explain the details of the arrangement; and in this duty he was assisted by Mr. John West and two of his sons, Messrs. John and Fred. J. West.

Mr. Byrom first put the air compressor in operation. The necessary working pressure was shortly reached, when the regulator came automatically into action—reducing the speed of the compressor, as already described. The Committee afterwards proceeded to the retort-house, where several retorts were charged by the Chairman and Deputy-Chairman, who expressed themselves as perfectly satisfied with the smooth working of the machines, and the ease and rapidity with which the needful operations of starting and stopping the plant can be acquired by the attendant.

After the official inspection, the Committee and other members of the Corporation—among whom were the Medical Officer of Health, Dr. Howarth, and the Borough Treasurer, Mr. R. W. Buxton—adjourned to the Royal Hotel, where they dined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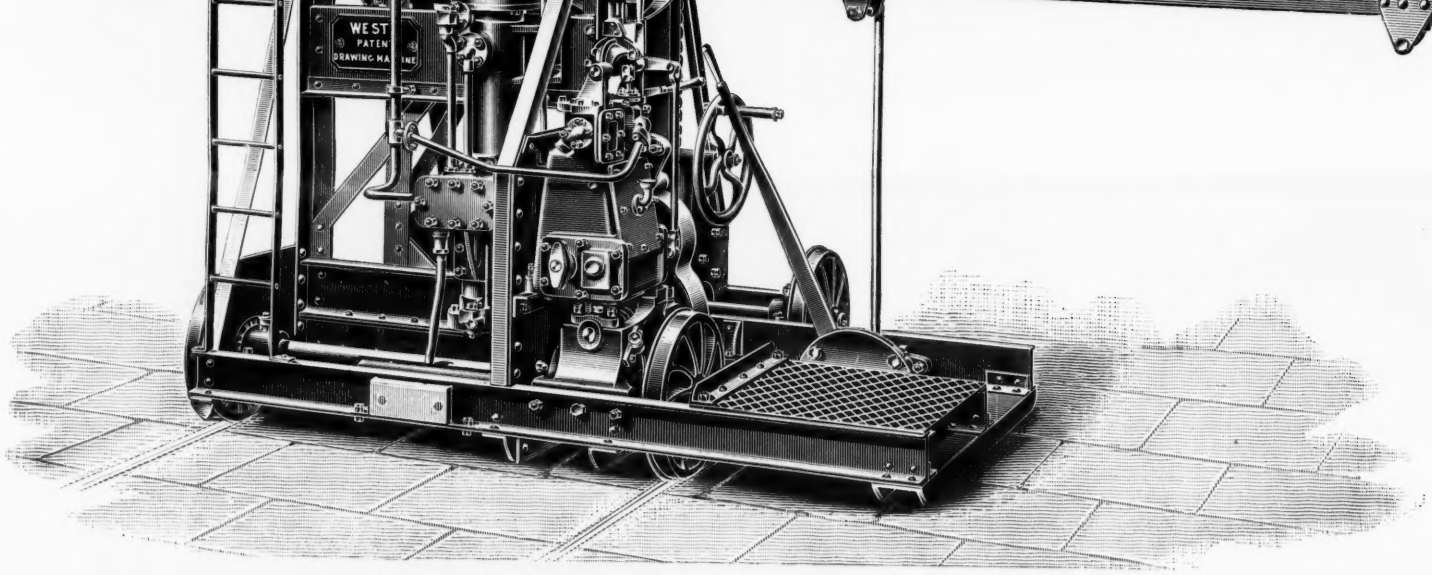
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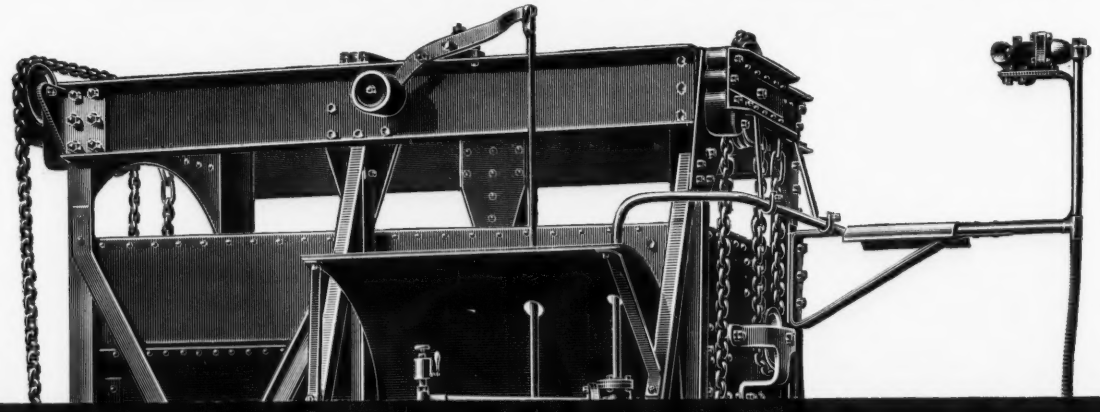
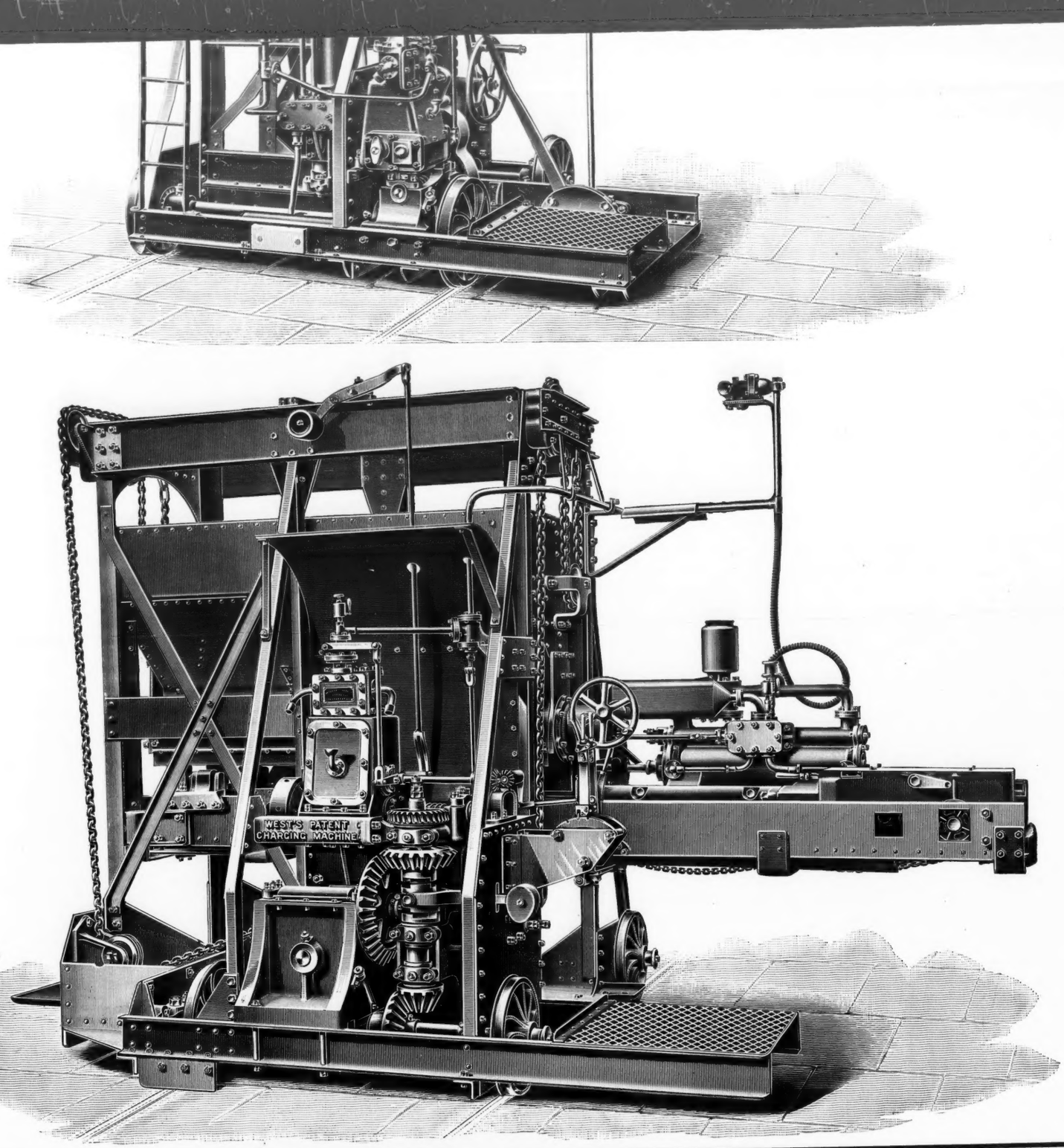




RETORT CHARGING AND DRAWING MACHINES AT THE BURY (LANCS.) CORPORATION GAS-WORKS.

WEST'S COMPRESSED-AIR SYSTEM.

together. The evening's proceedings were enlivened with music interspersed with speeches referring to the general management of the gas undertaking in Bury; the Chairman especially alluding to the excellent way in which West's Gas Improvement Company, as Contractors, had carried out the whole of the work which had from time to time been entrusted to them.

NOTES ON THE ENRICHMENT OF COAL GAS.

(*Concluded from p.* 845.)

Summary of Results.

The methods by which coal gas may be enriched by a few candles, have now been dealt with in turn; and the cost of enrichment per candle per 1000 cubic feet has been deduced for each enriching agent. In the appended table are collected the estimates which appear to be the most generally acceptable, and are fairly comparable with one another. Details of the estimates will be found on the pages of the "JOURNAL" to which references are given; but the following recapitulation of data may prove of service. It is assumed that the raw materials are obtained at the following prices: Cannel coal, yielding 11,466 cubic feet of 28·54-candle gas per ton, at 15s. per ton; carburine, of ·680 sp. gr., 8d. per gallon; petroleum spirit, of ·700 sp. gr., 6d. per gallon; 90 per cent. benzol, 2s. per gallon; Scotch shale or Russian distillate gas oil, 2½d. per gallon; gas coke, 9s. per ton; calcium carbide, £28 per ton. The calculations are based on the enrichment values of the enriching gases; but in the case of cannel gas, the illuminating power of the undiluted gas is assumed also to represent its enrichment value.

Cost of Enrichment of Coal Gas.

Reference to Current Volume of the "JOURNAL."		Enriching Agent.	Cost per Candle per 1000 Cubic Feet.
Page 585	..	Cannel gas	0·57d.
,, 633	..	Vapour of carburine (sp. gr. ·680) .	1·25
,, 634	..	,, ,, petroleum spirit (,, ,, ·700) .	0·75
,, 634	..	,, ,, benzol, 90 per cent.	0·95
,, 681	..	Peebles oil gas	0·26
,, 681	..	Oxy-oil gas	0·27
,, 793	..	Carburetted water gas.	0·08
,, 844	..	Acetylene	6·60
,, 845	..	Abstraction of carbonic acid (by lime purification)	0·55

A glance at the tabulated results reveals the fact that, if the data on which the estimates rest are even approximately correct, carburetted water gas is, economically, infinitely superior to all other enriching gases. Next to, but far removed from it, comes oil gas produced by modern methods. Evidently, other enriching gases or vapours can only be employed when considerations of convenience outweigh those of economy. The cost of cannel enrichment is a very uncertain quantity; but it will seldom, and at few places, be lower than the figure given. After the lapse of a few years, enrichment by benzol vapour may be expected to become less costly, owing to increase in the production of benzol.

It may not be inopportune to state clearly the photometric conditions on which the figures given are dependent. In estimating the enrichment value of enriching gases, preference has been given to observations made as nearly as may be in conformity with the Instructions of the Gas Referees of the Metropolis for testing the illuminating power of common coal gas. These Instructions are fairly consistently followed in nearly all cases where common coal gas, or gas of from 15 to 17 candle power, is regularly tested in the interests of consumers. By tests made in accordance with the Referees' Instructions will the quality of the gas usually be judged; and the gas engineer must therefore appraise the practical worth of enriching agents by their effect on gas of which the illuminating power is so tested. He may firmly believe, with Mr. Hunt (*ante*, p. 687), that the method of testing the gas at a uniform rate of consumption is irrational; but such belief will generally be of small avail to him in the face of tests made by a gas examiner with the London argand burner at a consumption of 5 cubic feet per hour. For gas of 18-candle power and over, it may fairly be claimed that there is no such generally accepted code of conditions as the Referees' Instructions for testing common coal gas; and with rich gas, both burner and rate of consumption may legitimately be varied to suit its quality. In these "Notes" all quoted tests of coal gas—enriched or unenriched—of less than 18-candle power were believed to have been made with an argand burner at the 5 cubic feet rate, except in instances where flat-flame burners have been specially mentioned. Mr. Hunt fortunately has explained that his anomalous enrichment values for both carburine and benzol were obtained by varying the rate of consumption to suit the quality of the gas. Nevertheless his tests preserve approximately the ratio between the values for carburine and benzol which the tests of other observers give. He has thus confirmed the view held by German and other writers, that a gallon of benzol has from three to four times the enriching value of the same quantity of carburine.

It has been tacitly assumed in these "Notes," for the sake of simplicity of argument, that the ordinary gas oils, obtainable at about 2½d. per gallon on the sea-board, have the same value for carbonizing purposes whatever be their origin. Probably the assumption has not seriously affected the value of the deductions. At a later date, some remarks on the values of different classes of gas oils for carbonizing may perhaps be given, to supplement the present "Notes on Enrichment."

RECENT ADVANCES IN LIGHTING BY WATER GAS.

Water gas has lately been dealt with at considerable length in the "Journal für Gasbeleuchtung" by Dr. H. Strache, of Vienna, and Herr H. Dicke, of Essen. These gentlemen hold antagonistic views on many points; but as their papers cover similar ground, they may advantageously be placed side by side in a translation. In the following summary, the illuminating powers are given in English standard candles, one of which has been taken as equal to 1·14 Hefner units of light. In a few instances, slight discrepancies in the calculations may be observed; but they may be explained by the fact that some items in the original papers are given in round numbers, the significance of which becomes obscured when converted to English quantities and terms. Dr. Strache refers readers to his earlier contributions to many technical journals on the subject of water gas. Abstract translations of the more important of these contributions have been given in the "JOURNAL."*

Dr. Strache considers that one of the hardest problems in the manufacture of water gas turns on the application of coal in place of coke. When coal is used in an ordinary water-gas generator, it becomes carbonized during the "blow." The products of its carbonization therefore escape with the producer gas, and, as far as the water gas is concerned, are quite lost. Many attempts have been made to reverse these conditions, and achieve an economical utilization of the coal by retaining the products of its carbonization in the water gas. The earlier apparatus designed to attain this end had many ineradicable faults. Even the apparatus of Herre Dellwik, which gives excellent results with coke, loses in the blast gases the distillation products which contain so considerable a portion of the heating value of the coal, and thus does not utilize coal economically. Dr. Strache, however, claims that he has now devised an apparatus by which water gas can be made with economy from coal. With a very small plant, he secured a yield of 47,845 cubic feet of water gas per ton of coal. Thus 53 per cent. of the heat of combustion of the coal was retained in the gas; and with a larger plant, yields of from 54,000 to 72,000 cubic feet per ton of coal might reasonably be expected. But along with the higher duty he secures a greater yield from a plant of given dimensions. An apparatus of the old type which would give 530 to 700 cubic feet of gas per hour would be sufficiently large to yield from 1400 to 1770 cubic feet with Dr. Strache's improvements. A generator for this output would be 7½ feet high and 15¾ inches wide internally.

Dr. Strache considers that mains which have served for coal gas are quite fit for the distribution of water gas, as they commonly are incrusted within with sulphide and oxide, which protect the water gas from the metallic iron. He agrees with Herr Dicke that new mains for water gas should be tarred or galvanized. Dr. Strache, however, maintains that traces of iron which are introduced into water gas from the apparatus must be removed from it before distribution, as otherwise the efficiency of Welsbach mantles is rapidly destroyed. On this point Herr Dicke continues to be at issue with Dr. Strache,† and states that water gas which had not been treated for the removal of iron has been used at Radkersburg for a year and a half, and no ill effects to the mantles have been observed. He quotes in support of his statement a letter from the Burgomaster of the town testifying to the satisfactory behaviour of the water-gas supply. Dr. Strache does not yield on the point, but adds that the purification of water gas by scrubbing with sulphuric acid should be carried out for the sake of the removal of aqueous vapour alone. This process, originally devised for the abstraction from the gas of the iron compound which is said to injure the mantles, has already been described in the "JOURNAL."‡ The latest results show that the treatment of 1000 cubic feet of the gas requires an expenditure of only from 0·37 lb. to 0·62 lb. of concentrated sulphuric acid. The expense of removing iron and aqueous vapour from the gas is therefore not great; and even if the necessity of removing traces of iron be doubted, unquestionably the removal of aqueous vapour benefits the illuminating power of the gas, and prevents freezing and condensation in the mains. The popular view that water gas has a peculiar corrosive action on iron pipes is said to be quite erroneous, as the amount of iron taken up by the gas is in any case almost infinitesimal.

Dr. Strache has devised a special incandescent burner for use with water gas. With an ordinary Welsbach mantle and a gas pressure of 5-10ths to 12-10ths, the burner gives an illuminating power of from 88 to 220 candles. The consumption of water gas per candle-hour is from 0·05 to 0·07 cubic foot, according to the size of the flame, and is therefore not much higher than the consumption of acetylene per candle-hour (0·03 cubic foot). Acetylene,

* See Vol. LXIII., pp. 527, 568; Vol. LXV., p. 213; Vol. LXVII., p. 1217; Vol. LXIX., p. 24.

† See "JOURNAL," Vol. LXV., p. 218. ‡ See Vol. LXIII., p. 529.

however, costs now about 68od., and water gas only 6·8d. per 1000 cubic feet. The average consumption of coal gas in incandescent burners per candle-hour is 0·08 cubic foot, according to researches of Joly, Söhren, and Wedding; and consequently water gas shows a higher efficiency. Small burners for water gas have now been made, and one giving nominally 44 candles is almost as economical of gas as the more powerful sizes.

The annexed table shows the consumption of various illuminating agents, and also of the coal used in their production, for 1000 candle-hours. The figures indicate very clearly that the cheapest illuminant is water gas. Moreover, the charges for wages and interest are lower for water gas than for coal gas. Hygienically also water gas is now in the foreground, thanks to improved burners. Owing to low consumption, it gives only from one-third to one-fourth the amount of heat which comes from the coal gas Welsbach light; and the carbonic acid produced is less to almost the same extent. Low consumption also reduces the necessary diameter of mains and services to about one-third or one-half that of those used for coal gas. Similarly, gasholder capacity may be decreased, especially as the process of manufacturing water gas is rapid and reliable.

Consumption of Coal per 1000 *Candle-Hours.*

Illuminating Agent.	Production per Ton of Coal.	Consumption of Illuminating Agent per 1000 Candle-Hours.	Approximate Consumption of Coal per 1000 Candle-Hours.
Coal Gas.			
Flat flame	10,765 cubic feet	366 cubic feet	76 lbs. (1)
Welsbach light		84½ ,, ,, (2)	17½ ,, (1)
,, ,,		72½ ,, ,, (3)	15 ,, (1)
Water Gas.			
44-candle burner	41,725 ,, ,,	60½ ,, ,,	3½ ,,
88 ,, ,,		52 ,, ,,	2¾ ,,
Acetylene.			
Flat flame	1,016 ,, ,,	28 ,, ,,	61 ,, (4)
Electric Light.			
Incandescent	330 kilowatts	4·07 kilowatts	27½ ,,
Arc		1·14 ,,	7½ ,,

NOTES.—(1) These figures become less by about one-half if the coke made as a bye product be allowed for. (2) Ac ording to observations of Joly, Söhren, and Wedding. (3) According to observations of von Oechelhaeuser. (4) Omitting the carbon consumed as electrodes.

Herr Dicke states that there have been no instances of lighting solely by water gas until quite recently, except in the case of installations for special purposes, such as for the lighting of the Warstein pits and the railway station at Königszelt. Now, however, the town of Radkersburg, in Styria, is served with simple water gas for use with Welsbach burners; and the town of Brummen, in Holland, has a supply of carburetted water gas, in the manufacture of which the Dellwik generator is used. In many industries also this generator has been adopted, as it enables about 72 per cent. of the heating value of the coke to be realized in the water gas. The economy achieved by the use of the incandescent system of lighting is rapidly thrusting into the background supplies of highly luminous gas. Gas-works may shortly be called upon to make only feebly luminous or non-luminous gas; and water gas is undoubtedly the most suitable gas of this description. It gives a flame of very high temperature, that fuses platinum wire, which cannot be fused in a coal-gas flame. The emission of light from a Welsbach mantle depends on the flame-temperature; and hence a higher illuminating duty is obtained from water gas than from coal gas.

Herr Dicke proceeds to point out that, with the old type of water-gas generators, producer gas was made for nearly 45 minutes per hour. It was produced during the "blows," or periods of air-blast; and its volume was nearly four times that of the water gas. It absorbed about half the calorific value of the fuel. In some cases the producer gas could be utilized for heating boilers or gas-retorts; but in many instances the variable rate of its production and the loss of its sensible heat in transport, put such applications out of the question, and the whole of the heat absorbed in the producer gas was lost. Water gas only is made by the Dellwik generator, as during the blows the resulting gas is completely burnt within the generator itself; and its combustion heats the fuel therein. Compared with the old type, a much greater amount of heat is liberated in the generator, and hence the periods of gas making can be prolonged. The blows occupy only 15 minutes, or less, per hour; and water gas is actually made during the remaining 45 minutes. The relative durations of blow and run in the old process are thus inverted in the Dellwik process. The make of gas in the old generators averaged from 28,700 to 32,300 cubic feet per ton of coke, whereas as much as 71,770 cubic feet have been obtained in a Dellwik generator. The latter is best adapted for town supplies, as it does not yield any producer gas, and makes at least twice as much water gas as does the old type of generator.

The heat available in the Dellwik generator for water-gas production is shown in the following heat-balance per kilogramme-molecule of the substances:—

	Calories.
18 kilos of steam require for decomposition 2 × 28,780 =	57,560
12 ,, of carbon burnt to carbonic oxide produce ,	28,800
Heat which must be supplied . . . . =	28,760

This quantity of 28,760 calories must be supplied to the coke by the blow which precedes the make. The disposable heat from the blow is the difference between the total heat of combustion and the heat carried away by the gases produced during the blow. Then assuming that in the old process the carbon is burnt wholly to carbonic oxide, and in the Dellwik process to carbonic acid (the theoretically required amount of air only being used in both cases), the heat obtained is as follows:—

A.—*By the Old Process.*

		Calories.
12·0 kilos. of carbon burnt to carbonic oxide =		28,800
16·0 ,, of oxygen escape as carbonic oxide at about 700° C., and remove 28 × 700 × 0·248 (the specific heat of CO) . =	4,860 Cal.	
52·9 ,, of nitrogen accompanying the 16 kilos. of oxygen at 700° C. remove 52·9 × 700 × 0·244 (the specific heat of N) . . . . . =	9,035 ,,	
		13,895
Calories available		14,905

B.—*By the Dellwik Process.*

		Calories.
12·0 kilos. of carbon burnt to carbonic acid 12 × 8080 . . . . . =		96,960
44·0 ,, of carbonic acid at 1000° C. remove 44 × 1000 × 0·217 (the specific heat of CO_2). . . . . =	9,548 Cal.	
105·8 ,, of nitrogen accompanying at 1000° C. remove 105·8 × 1000 × 0·244 . =	25,814 ,,	
		35,362
Calories available		61,598

For equal consumption of carbon, the Dellwik process therefore gives four times as much heat available for the production of water gas as the old process afforded.

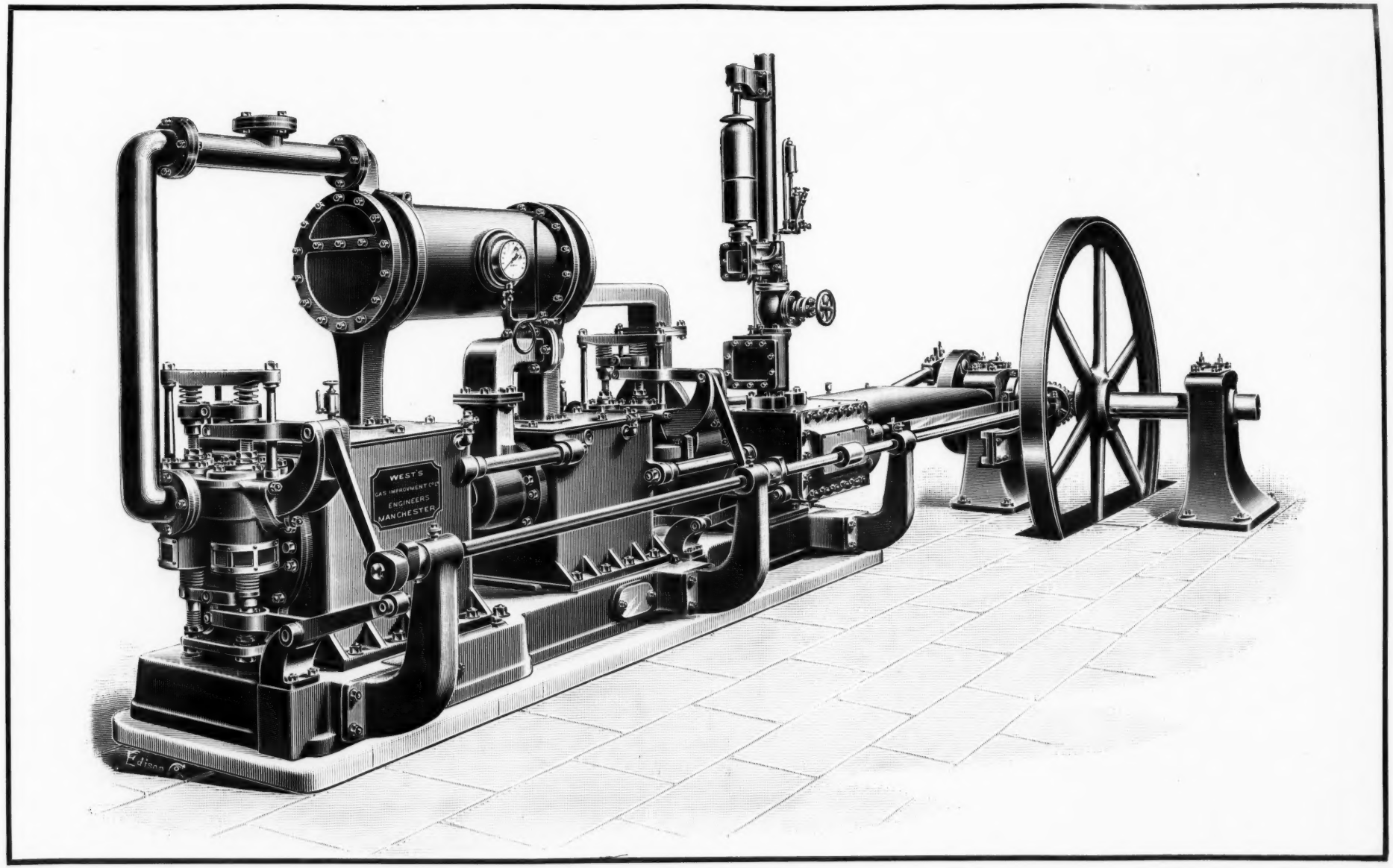
Herr Dicke described, by the aid of plates accompanying his paper, four types of water-gas installations. He recommends the adoption of simple water gas, rather than carburetted water gas or mixed gases, wherever practicable, on account of the lower cost of installation and production. The cost of the plant is from one-half to a quarter that of a coal-gas plant of equal productive power; and the cost of the water gas is about half that of coal gas. The first plate shows a simple water-gas plant, consisting of a generator, a reserve generator, a scrubber, a relief holder, purifiers, station meter, gasholder, governor, and odour-infusing apparatus. The last-mentioned consists of a simple dropping apparatus, which allows mercaptan or carbylamine to drop in suitable quantity into the main, and impregnate the outflowing gas. The second plate shows a very similar plant, with the addition of a carburetting apparatus, which is placed after the relief holder, and consists of a retort in which oil is carbonized and the oil gas is fixed in contact with the water gas. The third plate shows a scheme for the enlargement of an existing coal-gas works by the addition of a simple water-gas plant. If the whole of the coke made is used for the production of water gas, the output is increased to 2·6 times that of the original coal-gas works. The non-luminous water gas passes from the relief holder into the stream of coal gas between the exhauster and the purifiers; and the mixed gas is raised to the desired illuminating power by carburetting by means of benzol at the inlet to the gasholder.

Precise figures as to the practical advantage of this mixing process are not yet obtainable; but some valuable information has been secured by Herr Schimming, from a water-gas plant at the Charlottenburg Gas-Works. On the strength of this information, Herr Dicke makes the following comparison for a typical works in the Rhine district for a production of 127,140,000 cubic feet per annum of coal gas, or an equivalent volume of mixed gas: 1 ton of coal yields about 10,400 cubic feet of coal gas and 0·65 ton of coke, of which there is used in firing the retorts about 0·18 ton, leaving available for the manufacture of water gas 0·47 ton. In recent generators, a ton of coke readily yields in practice 57,400 cubic feet of water gas (by continuous working, even 71,770 cubic feet can be obtained); and therefore 0·47 ton of coke will yield 26,980 cubic feet. The production of mixed gas per ton of coal will therefore be 10,400 + 26,980 = 37,380 cubic feet. This mixed gas, consumed in the Welsbach burner at the rate of 7·063 cubic feet per hour, gives an illuminating power of 87·7 candles; and therefore 1 ton of coal affords about 460,000 candles. The coal gas, at a consumption of 3·885 cubic feet per hour, has a candle power of 52·6; so that the coal gas from 1 ton of coal affords 141,000 candles. Thus the mixed gas gives about three times as much light per ton of coal as does the coal gas alone. Since 7·063 cubic feet of mixed gas give 87·7 candles, 4·238 cubic feet would give 52·6 candles, or the quantity of light afforded by 3·885 cubic feet of the coal gas. Therefore, in order to obtain the same quantity of light, from mixed gas, there must be consumed

$$\frac{4{\cdot}238}{3{\cdot}885} = \frac{120}{110} = 1{\cdot}091$$

times the volume of coal gas; or in place of 127,140,000 cubic feet of coal gas, about 144,200,000 cubic feet of mixed gas must be supplied. This volume of mixed gas will consist of 42,300,000 cubic feet of coal gas and 101,900,000 cubic feet of water gas. To produce the coal gas, about 3700 tons of coal will be needed; and therefrom 2480 tons of coke will be obtained, of which 1988 tons suffice for the production of the 101,900,000 cubic feet of water gas, while 472 tons are required for firing the coal-gas retorts. A surplus of 20 tons of coke

SUPPLEMENT TO THE JOURNAL OF GAS LIGHTING," &c., OCT. 26, 1897.



WEST'S TWO-STAGE AIR-COMPRESSOR AT THE BURY (LANCS.) CORPORATION GAS-WORKS,

WITH INTERMEDIATE COOLER AND POSITIVE-ACTING SUCTION AND DELIVERY VALVES.

remains, and can be used for the production of the steam required in the water-gas process. About 62½ lbs. of steam are necessary per 1000 cubic feet of water gas; and assuming that 1 lb. of coal gives about 7 lbs. of steam, some 394 tons of coal are required to produce the steam necessary for the manufacture of 101,900,000 cubic feet of water gas. Of this amount of fuel, the surplus coke furnishes 20 tons; and therefore only 374 tons of coal are required for steam production. Adding this quantity to the 3700 tons of coal carbonized, the total coal necessary for producing mixed gas equivalent in lighting value to 127,140,000 cubic feet of coal gas is 4074 tons. To produce 127,140,000 cubic feet of coal gas requires 14,360 tons of coal, or more than three times the quantity necessary for the equivalent volume of mixed gas. The average selling price of the coal gas would be 43·5d. per 1000 cubic feet; and having regard to the increased consumption of the mixed gas per candle, and the difference in the calorific values of the two gases, the corresponding selling price of the mixed gas would be 37·3d. per 1000 cubic feet. Appended is a tabulated computation of the manufacturing charges and profit for the two descriptions of gas.

Cost of Manufacture per 1000 *Cubic Feet.*

	Coal Gas.		Mixed Gas.
Expenditure—			
Coal	14·57d.	..	4·47d.
Fuel	0·29	..	0·10
Purifying materials	0·14	..	0·16
Maintenance of settings	2·09	..	0·69
" " apparatus and engines	0·58	..	0·58
" " mains	1·62	..	1·62
" " gas-meters	0·27	..	0·27
Street lighting	3·02	..	3·02
Sundry repairs	2·42	..	2·08
Expenses	1·49	..	1·49
Wages	6·59	..	1·65
Salaries	2·43	..	2·43
Interest	2·47	..	1·53
Wear and tear	4·40	..	2·72
Totals	42·38	..	22·81
Receipts from bye-products, &c.—			
Meter-rentals	1·07d.	..	1·07d.
Coke	6·54	..	0·00
Tar and ammonia	2·71	..	0·90
Private installations	0·53	..	0·53
Breeze	1·03	..	0·20
Totals	11·88	..	2·70
Prime cost per 1000 cubic feet	30·50	..	20·11
Average receipts " "	43·50	..	37·32
Net profit " "	13·00	..	17·21

The total profit therefore would be: Coal gas, 127,140 × 13·0d. = £6886 15s.; mixed gas, 144,200 × 17·21d. = £10,340 7s.

Apart from the convenience afforded by a simple means of enlarging the productive power of a gas-works, a considerable economy evidently results from the introduction of mixed gas. The latter is only feebly luminous, and therefore must be carburetted by a benzol carburettor placed after the consumer's meter in cases where luminous open flames are preferred to Welsbach burners. The difference between the prime costs of coal gas and the mixed gas is ample to cover the outlay on carburetting the latter. The cost in the gasholder—*i.e.*, cost of coal, fuel, purification, repairs to settings, apparatus, &c., and wages, less the receipts for bye-products—according to the above computation, is 12·38d. per 1000 cubic feet for coal gas and 4·94d. for the mixed gas. The heating values per 1000 cubic feet are: Coal gas, 150,070 calories; mixed gas, 94,855 calories. Hence the holder cost of 1000 calories is for coal gas, 0·082d.; and for the mixed gas, 0·050d. Therefore for a given calorific effect, the mixed gas can be put into the holder at about 40 per cent. less cost than coal gas. The Charlottenburg experiments showed that the most suitable mixture for carburetting consisted of 2½ volumes of coal gas and 1 volume of water gas. This mixture was enriched by 1 candle by the addition thereto of 1600 grains of benzol; and the calorific value of the carburetted gas was somewhere about 127,420 calories per 1000 cubic feet.

Another simple method of producing mixed gas when the price of oil is sufficiently low, consists in making carburetted water gas and adding it to the coal gas. A retort which produces normally about 353 cubic feet of coal gas per hour, should yield 1410 to 1590 cubic feet of carburetted water gas of 14 to 19 candle power per hour. The make for a similar sized retort is thus increased four-fold. The last plate accompanying Herr Dicke's paper shows a method of combining a carburetted water-gas plant with a coal-gas plant. The simple water gas passes from the relief holder to retorts into which oil is simultaneously introduced; and the carburetted gas is drawn by an exhauster from the hydraulic main through a condenser to the purifiers, in which it mixes with the coal gas. In England and America, water gas is carburetted in large recuperative chambers attached to the generator. There are, however, three factors which determine the production of a good uniform gas—viz. (1) uniform make of water gas, (2) uniform amount of oil, and (3) uniform temperature. These conditions are best attained in a bench of retorts, as the volume of water gas admitted can be maintained constant by a valve on the inlet, and similarly the supply of oil can be kept constant by means of a regulating cock; while a nearly constant temperature can be preserved in the retorts by a practical furnace man. The candle power of the gas can be readily varied by adjustment of the water-gas and oil valves. The retorts are worked at about 1300° Fahr., instead of at over 1800° Fahr., as is the case with coal-gas retorts. When making 15-candle gas, the retorts require cleaning twice in 24 hours.

The above calculations are based on a yield of 53,825 cubic feet of water gas per ton of coke; but with the latest form of the Dellwik generator, as much as 86,000 to 89,700 cubic feet per ton are obtained. Two six-hour trials of a Dellwik generator have been made at the Warstein foundry, where these generators are now constructed. In one trial, 529 lbs. of smithy coke yielded 20,307 cubic feet of gas, with 1¾-minute blows and 12-minute runs. This is equivalent to 86,000 cubic feet per ton of coke. In the second trial, 640 lbs. of gas coke from Essen yielded 26,135 cubic feet of water gas, with 1¼-minute blows and 7½-minute runs. This is equivalent to 91,570 cubic feet per ton of coke. The higher yield of the gas coke may be explained by its greater porosity, and therefore larger surface area. When the necessary length of blow for any quality of coke has been ascertained, the clock may be made to sound an alarum at the times when the reversal of the steam and air valves should be made. The blast products in the first of these two trials contained on an average 18·2 per cent. of carbonic acid; and the water gas consisted of 3·6 per cent. of carbonic acid, 40·4 per cent. of carbonic oxide, 51·0 per cent. of hydrogen, and a residue containing about 5·0 per cent. of nitrogen and 0·5 per cent. of methane. The smithy coke used contained about 92 per cent. of carbon; and therefore the make of water gas was at the rate of 93,300 cubic feet per ton of carbon. These figures show that a yield of 90,000 cubic feet per ton of carbon can be certainly obtained in practice on a large scale, which is equivalent to 81 per cent. of the total heat of the carbon being preserved in the water gas. Ordinary producer gas contains about 56 per cent. of nitrogen, while water gas contains only about 4 per cent. In industrial operations, therefore, the latter is preferable; and there is clearly a vast field for the fruitful use of the Dellwik generator. The generators used in the trials mentioned had a productive power of about 3532 cubic feet per hour; but in another and longer trial with Charlottenburg gas coke, about 4240 cubic feet per hour and 92,600 cubic feet per ton of coke were obtained.

Herr Dicke supplements the information given in his paper by a letter to the succeeding issue of the "Journal für Gasbeleuchtung." He propounds a fifth scheme for the application of water gas. In order to increase the output of a gas-works where land is not available for extensions, he proposes to introduce water gas into the coal-gas retorts in the same manner as he introduces it into retorts for the production of carburetted water gas from oil. Cannel coal yielding gas of about 31·5-candle power, if thus carbonized in a stream of water gas, would yield about double the ordinary volume of cannel gas of a mixed gas of 13 to 15 candle power.

Midland Association of Gas Managers.—The autumn general meeting of this Association will be held at the Grand Hotel, Birmingham, next Thursday. We learn from the circular issued by the Hon. Secretary (Mr. C. Meiklejohn, of Rugby) that no paper will be read on the occasion, but that after the transaction of the ordinary buisness, which will include the election of new members and of office-bearers for the ensuing year, a visit will be paid to the works of the New Conveyor Company, Limited, at Smethwick. On the return to Birmingham, high tea will be served at the Grand Hotel.

Lectures on "Gas Manufacture" and "Coal Tar Distillation." The Committee and Director of the Manchester Technical Schools have added to their syllabus this season a course of lectures on "Gas Manufacture," which will be delivered by Mr. J. D. Ashworth, the Chief Constructional Draughtsman in the office of the Corporation Gas Engineer. The syllabus is a very full one; the course embracing the chemical as well as the engineering branch of gas manufacture and distribution, and the treatment of the residual products. In addition to the lectures, the students will have the privilege of visiting the three gas-works of the Corporation, where the various appliances used in connection with gas making will be explained. There can be no question as to Mr. Ashworth's fitness for the work with which he has been entrusted; and the extent to which his teaching is appreciated may be judged from the fact that he has in his class already more than fifty members, who are by no means confined to the youthful portion of the community. While referring to lectures, we may mention that we have received from the Secretary of the Goldsmiths' Institute, New Cross (Mr. J. S. Redmayne, B.A.), the syllabus of a course on "Coal Tar Distillation," to be delivered by Mr. W. Jackson Pope at the Institute on Wednesday evenings, commencing to-morrow. Mr. Pope, who is a medallist in his subject, has prepared a very comprehensive series of lectures, which, as in Mr. Ashworth's case, will be fully illustrated by the aid of diagrams, experiments, and the optical lantern; and they should prove valuable to those who are studying the treatment of residuals in conjunction with gas manufacture.

REGISTER OF PATENTS.

Gas-Stoves.—Dame, J. E., of Brooklyn, U.S.A. No. 24,925; Nov. 6, 1896.

This invention has for its object to provide a gas-heater in connection with water circulating apparatus, or means for employing either water or steam as an auxiliary in producing the required heat. A further object is to combine a gas-heater which employs radiators, and a circulatory apparatus for water, a hot-air drum into and through which the products of combustion are passed, and through which also extend air-tubes, which serve as auxiliary means for heating the air. The heater consists of an oblong fire-box (preferably rectangular in cross section, and square or approximately so), near the bottom of which, and at each side, are arranged two longitudinal plates, between which the burner is placed. The burner consists of a longitudinal box composed of two vertical side-plates, a bottom plate formed integrally with the vertical side-plates, and a top-plate, which is semi-circular in form in cross section, and which is preferably formed integrally with the vertical side plates. The burner is removable from the fire-box; being capable of being slid out at the end, so as to provide means for repairing the burner or cleaning it.

High-Pressure Gas-Engines.—Oechelhaeuser, W. von, of Dessau, Germany. No. 24,994; Nov. 7, 1896.

This invention relates to "high-pressure gas-engines having two pistons moving in opposite directions in the same working chamber, which pistons in their outermost end position uncover the openings arranged at the opposite ends of the working chamber for the admission of compressed air, and the escape of the products of combustion."

Fig. 1.

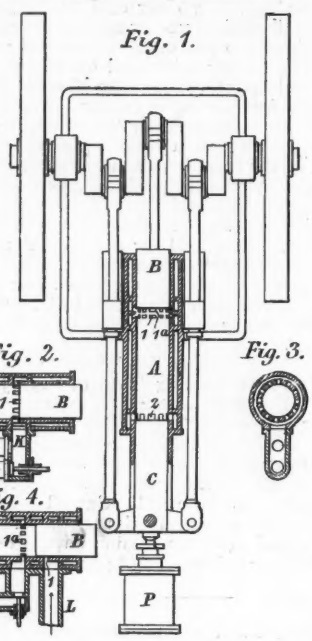


Fig. 2.

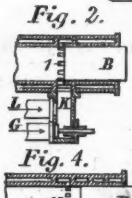
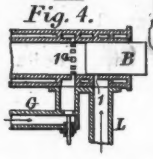


Fig. 3.

Fig. 4.



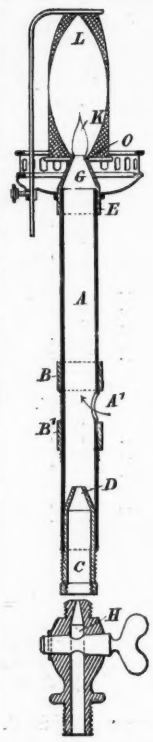
If, says the patentee, a gas-engine like that described in patent No. 14,317 of 1892 be operated by a very poor gas—such, for instance, as blast-furnace top gas, which has only about one-fifth of the heating power of ordinary lighting gas—it would be necessary to force from the gas-pump five times as large a quantity of gas as, in the case of working with lighting gas, must, during the period of compression, be forced into the combustion chamber between the two working pistons if the high-pressure pump hitherto employed were used for highly compressing the gas. The loss of power would thereby be considerably increased: Firstly, through friction in the high-pressure gas-pump, which latter has to be increased five-fold in volume, and thus at each moment must produce a somewhat higher pressure than actually exists in the working chamber; and, secondly, by the excess pressure of the gas. It is in order to avoid these drawbacks (which, where poor combustible gas is used, considerably diminish several advantages of high-pressure gas-engines as regards consumption of gas, space occupied, weight, and cost of erection) that the form of machine shown in the accompanying illustration has been designed. Fig. 1 is a horizontal section of the engine. Figs. 2, 3, and 4 are detail views.

The gas-pump P is, when necessary, coupled tandem-fashion to the rear piston, which in working with blast-furnace top gas has to draw in the gas, but only compresses it to a pressure of about 0·3 to 0·6 atmosphere, instead of, as in the known arrangement for lighting gas, to 10 to 12 atmospheres; while the necessary air for expelling the products of combustion is obtained in this case from an existing air-pipe (in other cases from a central compressed-air pipe or the like). The admission of gas to the working chamber takes place only at a low pressure of, for instance, one-third of an atmosphere; and the high compression of the gas and also of the air necessary for a high-pressure gas-engine (for instance, 10 atmospheres), only takes place in the working chamber between the approaching pistons. An expulsion as complete as possible of all the gases of combustion, and a separation at certain periods and places of the expelling air current from the gas-charge, is, according to the different kinds of gas supply, effected by the other piston B, which regulates the induction by uncovering at the end of its outward stroke two rows of openings arranged immediately behind one another in the wall of the cylinder, of which rows the first (1) is connected with the pipe supplying the expelling air, and the second (1^a) with the gas-pipe which is separate from the air-pipe. Therefore, at the conclusion of the expansion period, after the rear piston C has uncovered the discharge-openings (2) at the rear end of the cylinder, the row of openings (1) for the inlet of air will first be uncovered by the other piston B, and then the row of openings (1^a) for the inlet of gas. On the return of the pistons, the openings will be again covered and closed in the reverse order.

If it be desired to avoid the double row of openings (1 1^a) and work with a single row, the induction of gas may be effected from a pipe G, fig. 2, in close proximity to the working chamber leading into an air-chest or supply-chamber K fed from an air-pipe L; the gas induction being controlled by a valve, whereby the gas actually enters the working chamber through the same openings (1) as the air, but at a somewhat later period of time. A valve or closing device may, however, be provided for the gas-pipe G, and the latter be entirely separate from the air-pipe L, as shown in fig. 4, so that the gas enters directly into the working cylinder through the gas-opening (1^a) as soon as the piston has closed the air-opening (1).

Applying Acetylene to Incandescent Lighting.—Edwards, E.; a communication from R. Türr, of Paris. No. 26,041; Nov. 18, 1896.

This invention has for its object the use of a material in the form of a hood (of any of the well-known kinds) rendered incandescent by the combustion of acetylene gas and air. The bunsen burner is arranged vertically, and provided with means for regulating the admission of gas, and with openings through which air is admitted to mix with the gas, "in such proportion that the flame obtained consumes all the carbon, and forms a small greenish-blue central cone, surrounded by a reddish external one." Outside this flame, the mantle is arranged as usual.



A is a tube, with one or more lateral openings A^1. Round these openings, the tube is screwed for a sufficient distance to receive two corresponding rings B B^1, to completely close or open the openings. Into the combining chamber A, at its lower end, is screwed the tube C, provided at its upper end with a cone D, having a central aperture for the passage of the gas. Upon the upper end of A is screwed a cylinder or cap E, having an upper truncated cone G. The chamber A being fitted with the tube C and the cap E, the whole are screwed upon a cock H, through which the acetylene enters. It escapes by the opening O. By using the regulating-rings B B^1 to unscrew or screw the chamber A upon the tube C, after having lighted the gas, the admission of air and the distance of the cone D are adjusted until the flame is composed of a greenish-blue cone K and an outer reddish flame L.

The main object is to secure at each orifice a flame of the kind described—that is to say, at the orifice of the burner, a flame should be obtained having a clearly defined blue-green cone, surrounded by a reddish outer flame. The presence of these two distinctive colours is the characteristic of the heating flame for acetylene gas; and they are indispensable in order to obtain the desired effect for incandescence and heating. In the drawing accompanying the specification are shown, by way of example, a number of different forms which may be given to the burner, either of which may be used, according to different circumstances and conditions, at the upper part of the mixing chamber. The mixing or combining chamber is always the same; only the conical part fitted to the burner varies in form—the total section of the orifices through it being always less than that of the mixing chamber.

Self-Lighting Incandescent Gas Mantles.—Duke, J. F., of West Dulwich, S.E. No. 26,618; Nov. 24, 1896.

The object of this invention is to render incandescent gas-burner mantles self-lighting by the action of the gas upon an automatic gas-igniter of the kind described in patent No. 969 of 1895—that is to say, a block of meerschaum or other porous material, containing in its pores platinum black or other suitable metal of the platinum group, or a combination of such metals.

The patentee proposes to draw or paint a very fine line of highly concentrated solution of platinum bi-chloride from the upper part towards the lower part of the mantle, and which is preferably done before the foundation of the mantle has been burnt out. After it has been burnt out (during which process the platinum bi-chloride will be converted into metallic platinum), there is applied over the line of platinum a streak of solution of carbonate of lime, or any other metallic oxide suitable for the purpose containing an exceedingly small proportion of platinum bi-chloride. The solution of carbonate of lime can readily be obtained from a solution of hydrate of lime in a saturated solution of carbonic dioxide in water; the solution also containing an exceedingly small proportion of platinum bi-chloride. One part of platinum bi-chloride to 20,000 parts of the carbonate of lime solution is a suitable proportion for the purpose. The bi-chloride of platinum so contained becomes converted into metallic platinum on being submitted to the heat of the gas-flame. To the mantle, and in contact with the upper end of the line of platinum, there is fitted the porous block referred to in the earlier invention, which contains platinum black or other suitable metal of the platinum group in its pores.

When the gas, on being turned on, comes in contact with the porous block, it becomes heated to a red heat; and the heat is communicated to the line of platinum on the mantle. The platinum, in its turn, communicates it to the lime with which the very small amount of platinum has become mixed by the addition of platinum bi-chloride; and owing to the presence of this finely-divided platinum, the heat is transmitted from the platinum line to the carbonate of lime, which is thereby converted into oxide of lime, becomes incandescent, and ignites the gas.

As an alternative course of action, the patentee first applies the line of highly concentrated solution of platinum bi-chloride to the foundation of the mantle. He then dries this line at a temperature sufficiently high (say 400° Fahr.) to convert the bi-chloride into mono-chloride, which, being insoluble in water, will have no tendency to spread when the mantle is subsequently dipped in the solution. He then dips the mantle in a solution of refractory metals, such as are ordinarily employed for the purpose, but containing an exceedingly small proportion—say, 1 in 40,000—of platinum bi-chloride. He then treats the impregnated mantle in the manner ordinarily followed, during which treatment the platinum bi-chloride in the fine line, and also that which is finely distributed throughout the mantle, becomes converted into metallic platinum.

Incandescent Gas-Light Burners.—Denayrouze, L., of Neuilly, France. No. 28,491; Dec. 12, 1896.

In his previous patent (No. 21,371 of 1896), the inventor has described a bunsen burner for incandescent gas lighting, having a cup or shell of semi-ovoid form, enclosing what would be the lower part of the flame up to the level of the top of the central blue cone of the flame; this cup being covered by wire gauze. A thorough mixture of the gas and air is thus obtained—producing "an intensely hot flame above the gauze." The present invention relates to burners constructed on this principle.

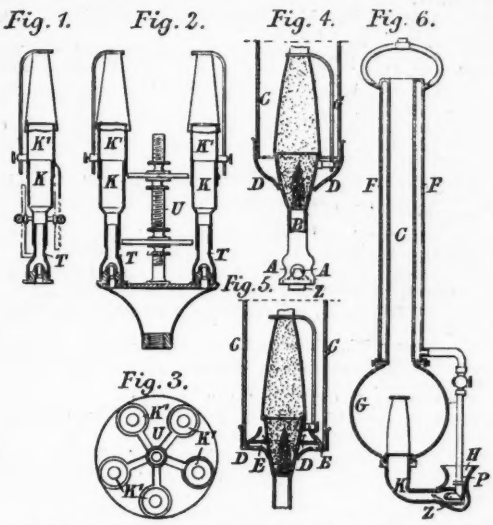


Fig. 1 is a vertical section of a burner provided with means for regulating the height of the cup. The tube T forms a guide for the sliding cup K, which widens out from a sloping shoulder, and which forms the guide for an upper tube K^1 having the incandescence mantle carried over it. The parts K K^1 can be raised and lowered by pinions gearing with racks fixed to the base of the tube T, and to the upper tube K^1.

Fig. 2 is a vertical section, and fig. 3 is a plan of a multiple burner of the kind described; the parts K and K^1 being raised or lowered by nuts on a central screwed upright U, moving crossheads attached to K and K^1 respectively. The adjustment of the height of K and K^1 determines the proper mixture and velocity of the air and gas supplying the flame.

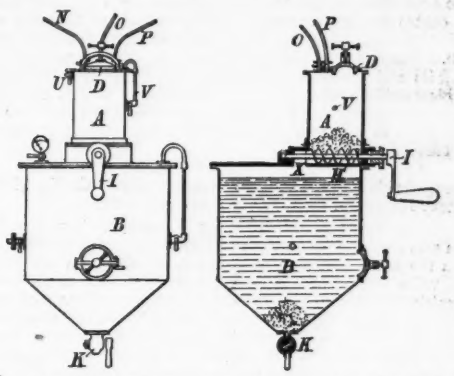
Fig. 4 is a vertical section of a burner in which the chimney draught is utilized to improve the mixture of air and gas and increase the velocity of its issue. The chimney glass C is carried on a gallery D, fixed air-tight on the tube B. The wire gauze is here fitted just above what would be the central blue cone. The chimney draught causes air to be drawn in by the holes A at the base Z; the draught being increased by adding a metal chimney above the glass.

Fig. 5 shows a modification, according to which a small air-chamber E is formed in the gallery D (under a partition); air being admitted by small obliquely-directed holes. The parts being highly heated by conduction, the hot air issues from the chamber E by a narrow annular opening, and ascends along the mantle. Although, in this case, the effect of the draught is somewhat lessened, the light is said to be appreciably improved by the effect of the hot air.

In the vertical section fig. 6, the mantle is in a glass globe G, surmounted by a chimney C, having an outer casing F. The gas supplied descends the annular space between C and F, and passes to the jet Z. Air enters by the funnel, H, and mixes with the heated gas in the chamber K, which is of gradually increasing area, and is surmounted by a wire gauze. The gas-supply pipe may have a joint P, so that the burner, mantle, and globe can be turned aside from under the chimney, and so give access for cleaning the globe or replacing the mantle.

Manufacturing Acetylene.—Resener, P. de, of Paris. No. 30,037; Dec. 30, 1896.

The construction of this apparatus (shown in elevation and vertical section) will be appreciated from the following description of its mode of action. In order to fill a gasholder at low pressure, all that is needful after having opened the air-escape valve U, is to turn the screw H by means of the crank I. The carbide at the lower part of the receiver A then engages with the thread of the screw, and being pushed to the aperture X, falls into the water in the tank B, where it decomposes, producing acetylene which drives out the air contained in the apparatus through the cock U. When the gas commences to escape through this cock, it is closed, and the cock on the pipe N is opened. The heat generated by the decomposition of the carbide raises the temperature of the water in the tank; but it will be lower according as the quantity of water is greater. In the proportion of 10 kilos. of water to 1 kilo. of carbide, the temperature will not rise beyond 35° as a maximum. After having driven the air from the apparatus, the acetylene produced traverses the receiver A, and, passing through the pipe N, is delivered to the washing, purifying, and drying apparatus. On continuing to turn the screw, the production of the gas goes on uninterruptedly until the reserve of carbide contained in the receiver is exhausted. At this moment, as the pressure in the apparatus is very low, it is only necessary to open the cock of the pipe P, which conducts water from a reservoir situated at a sufficient height for it to enter and fill the apparatus, driving out the gas before it.

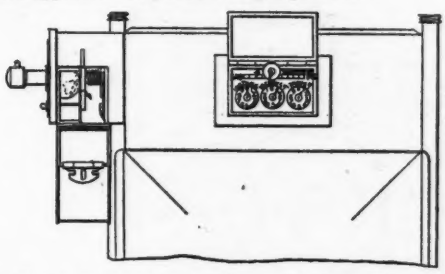


When the water-gauge V shows that the apparatus is full of water, the cocks on the pipes N and P are closed. At this moment, as there is no longer any gas remaining in the apparatus, if the cover D and the large drain-cock K be opened, the water from the tank will escape, carrying with it the lime residues S accumulated in the conical bottom of the tank. When the water has descended to its normal level in the tank, no more lime will remain in it. The drain-cock K is then closed; the carbide-receiver A is filled; and the apparatus is again ready to work.

When supplying the acetylene to a gasholder, the cock and pipe O are useless, and may be dispensed with. When, on the contrary, the apparatus is intended to produce gas under pressure, and to fill a reservoir or accumulator, the retaining cock and pipe O are also necessary. The gas in this case is made by continually turning the screw H, causing the carbide to fall into the water in the tank. But when the carbide is exhausted, since the pressure in the interior of the apparatus is the same as that in the reservoir or accumulator, if, after having closed the outlet-pipe N, the cover D be opened, the whole excess of acetylene would escape immediately into the atmosphere, unless provision were made for storing the excess in a special receiver, either in a second similar apparatus ready for operation, or in the bell of an ordinary gasholder. In the latter case, after having closed the cock N and opened the cock O, the retaining-pipe will conduct the gas under the bell of the holder, and the end of the operation will be similar to that already mentioned in reference to low pressures.

Prepayment Gas-Meters—Bromhead, S. S.; a communication from F. E. Morgan, of New Haven, U.S.A. No. 8254; March 31, 1897.

This invention relates to coin-controlled meter apparatus and to gas-supply controlling mechanism held inside a meter in connection with the usual index-mechanism, arranged to automatically cut off the flow of gas when the coins' equivalent of gas has been consumed. The illustration shows, in front elevation, a gas-meter having this invention applied thereto; the lid of the index of the meter and the cash-box of the coin-controlled apparatus being shown in open position.



There is a shaft which reaches into the meter and connects with the shaft of the supply-controlling mechanism, so that the two act as one, to be turned in one direction only after the insertion of a coin. On the coin being passed into the coin-controlled apparatus, a main shaft thereof aligned with the other shafts (and which terminates at about the centre of the casing of the apparatus) is caused to operate a pawl and ratchet, so that by the turning of the main shaft by the purchaser, the other shafts may be turned a specified portion of a complete revolution for each coin inserted. The coins as inserted are successively received by, and held during the turning of the main shaft by coin-holders, which are relatively stationary—that is, they do not revolve with the main shaft. The action of one of the coin-holders due to the forcible insertion of a coin releases the main shaft, and at the same time connects it with the adjacent shaft; so that the main shaft becomes a key for operating the entire mechanism dependent upon the act of inserting a coin, which itself acts as a key for unlocking the main shaft. The coin remains in the coin-holders until a combined price-changer and coin-trip dislodges the coin at a pre-determined point in the revolution of the main shaft, whereupon the further purchase of gas ceases until the introduction of another coin into the slot. While turning the main shaft in the direction of purchase, the coin-slot is closed by a plate or apron, which is locked in the closed position over the coin-slot until the slot-closing plate is released by turning the main shaft and trip back to the starting point, or the point at which each purchase of gas must begin.

The supply-controlling mechanism is attached to, operated by, and made a part of, the usual index-mechanism of the meter; so that the

act of securing the index-mechanism in the meter also secures the supply-controlling mechanism in place.

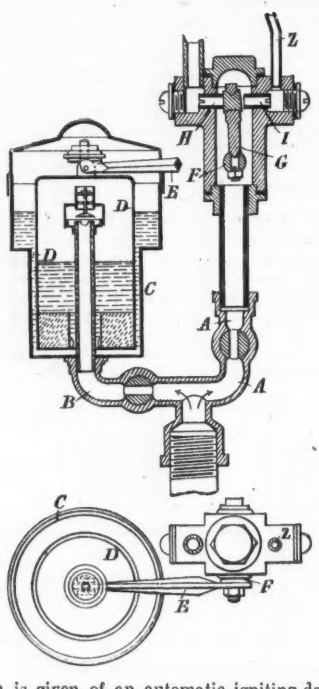
Burners for Acetylene.—Kitchen, J. G. A., of Manchester. No. 9762; April 17, 1897.

The object aimed at by the patentee of this acetylene burner is to prevent the carbon deposit produced on combustion from choking the orifice or orifices in the burner, by forming the external termination of each orifice trumpet-shaped or bell-mouthed, so that the edge of the flame at which the deposit occurs is carried some distance away from the orifice. The nozzle of the burner is made in the form of a piece of tube having its end turned inwards all round. The patentee says he finds that glass-tubing of suitable size so formed makes an efficient and inexpensive burner; and there may sometimes be fitted into it an india-rubber lined socket, so as to enable the glass tube to be readily inserted and removed.

Igniting-Device for Gas-Lamps.—Nebendahl, C. F., of Wandsbeck, near Hamburg. No. 19,211; Aug. 19, 1897.

This automatic igniting-device for gas-lanterns is actuated by a float, which sets the lamp in and out of action as soon as the pressure of the gas in the main increases or decreases by having a pendulum or bell-crank valve acted upon in such a manner that it closes the channel of the igniting-tube when the pressure of the gas is increased after having opened the feeding channel of the lighting-flame, and after the latter has been ignited, while the bell-crank valve closes the feeding channel of the lighting-flame whenever the pressure of the gas is reduced after having opened the igniting-channel and produced the igniting-flame.

It is presumed that the difference in the pressure amounts at least to 5 mm., though the admission of higher differences of pressure is unlimited. The equivalent of 1 mm of gas pressure is 2 grammes. If, for instance, it is intended to extinguish at a certain time, at a day-pressure of 20 mm., a certain number of lamps, and have another number left burning, the weight on the floating body of the igniting-device will have to be increased to the extent of 10 grammes, and the pressure must increase at least from 20 to 30 mm. It is obvious that these lamps will only start burning after the pressure has risen to 30 mm.; and that they will become extinguished if the pressure decreases to 25 mm. A greater difference in the pressure causes the igniting-device to be more reliable and indifferent to, and not affected by, variations of pressure and vibration or shaking.



An illustration is given of an automatic igniting-device (in section and plan) arranged according to this invention. A tube B branches off from the tube A—the latter leading to the burner and to the lighting-flame respectively, while B ends with a tube in a casing C filled with glycerine or other liquid. A floating bell D is arranged in this casing, the weight of which is reduced as far as necessary by virtue of a cork ring or the like, which helps to buoy it up. The floating bell which is immersed in the liquid is so arranged over the centre-tube, that the gas therefrom will lift the floating bell more or less according to the pressure of the gas. The floating body D is connected to the spindle F of the lever-valve G in such a way that the parts E F G form a bell-crank. The chamber containing them is connected to the gas-feeding tube A by a tube; while adjustable channels H and I, which are screwed to the chamber jacket or adjustably arranged in any other suitable manner, lead to the burner-tube and to the igniting-tube or igniting-channel Z respectively. If the floating bell falls, the lever G presses against the channel H; but if the floating bell rises, the lever G presses against the channel I, in order to shut off in both cases the feeding of gas to the burner-tube and the igniting-channel Z respectively. The rise of the bell is therefore limited by the lever G; the turn of the latter being determined and regulated by the adjustment of the channels H and I.

To render the lighting-flame unaffected by variation in pressure and vibration, and to enable the apparatus to turn the lever-seat even with a very small difference of pressure, the pressure-conduit leading to the floating body, which actuates the shutting-off valve-device, is separated from the conduit leading to the flame, and energy and movement are suitably adjusted by means of a bell-crank according to the requirements of the lamp. Supposing a floating bell has been weighted for a certain pressure, the shut-off cocks being opened and the bell-crank valve E F G being in the position shown, then the channel H feeding the flame will be closed, and consequently the gas is flowing through the opened channel I and the igniting-tube Z to the igniting-flame. If it is now intended to ignite the lamp or the lighting flame respectively, it will only be necessary to increase the pressure. The floating bell will be lifted because of the increased pressure, and the bell-crank valve will shut off the channel I after it has opened the channel H leading to the lighting-flame, and after this latter has been ignited. When the pressure is again reduced, the floating bell D and the bell-crank valve go back into the position illustrated, whereby the feeding channel H for the lighting-flame will be shut off after the igniting-channel has been opened, and after the flame has been ignited. The lamp is then again extinguished, and only the igniting-flame will be burning.

APPLICATIONS FOR LETTERS PATENT.

23,264.—Milne, J., "Gas-governor." Oct. 11.
23,273.—Ackroyd, W., "Generating, delivering, and storing acetylene gas." Oct. 11.
23,287.—Skriwan, E., "Mantles for incandescent lights." Oct. 11.
23,297.—M'Caig, W., "Gas-fires." Oct. 11.
23,310.—Klinger, W., "Igniting-devices for distant gas lamps or burners." Oct. 11.
23,318.—Brookes, A. G., "Acetylene lamps." A communication from T. Holliday. Oct. 11.
23,351.—Sigurdsson, O. V., "Manufacture of acetylene gas." Oct. 11.
23,361.—Thompson, W. P., "Gas-engines." A communication from The Chevalier H. Parthon de Von. Oct. 11.
23,450.—Speller, J. E., "Generating acetylene gas." Oct. 12.
23,458.—Wagner, M., and Pfemmert, A., "Production of acetylene gas." Oct. 12.
23,491.—Buerkle, A., "Water-heaters heated by gas, partly applicable to pilot-light gas-burners used for other purposes." Oct. 12.
23,541.—Cribbes, G., and Ross, A. F., "Obviating the noise caused from the exhaust gases escaping from gas-engines." Oct. 13.
23,543.—Edmundson, T., and Entwisle, F., "Generation of acetylene gas." Oct. 13.
23,545.—Schenk, W., "Mantles for incandescent lights." Oct. 13.
23,547.—Wartenweiler, A., and Spengler, R., "Production of acetylene gas." Oct. 13.
23,559.—Findlay, J., "Gas-brackets." Oct. 13.
23,582.—Priestman, W. D. & S., and Richardson, H., "Internal combustion engines." Oct. 13.
23,608.—Dowland, W. H., "Gas or oil engine." Oct. 13.
23,630.—Reddaway, F., "Tubing particularly applicable for conveying oil gas." Oct. 14.
23,717.—Webber, W., "Prepayment meters." Oct. 14.
23,746.—Igel, H., and Young, F. H., "Gas or oil engines." Oct. 15.
23,793.—Lundström, C. J., "Preservation of carbide, and its subsequent treatment for use in the production of gas." Oct. 15.
23,802.—Buffington, L. S., "Acetylene gas generators." Oct. 15.
23,804.—Hoffmann, F., and Ohlsen, W., "Automatic gas lighting." Oct. 15.
23,809.—Nehmer, H. & F., "Statical machines for lighting gas and the like." Oct. 16.
23,836.—Snelgrove, W., "Gas apparatus for tramway or similar locomotion." Oct. 16.
23,848.—Drach, J., "Water meters." Oct. 16.
23,887.—Atterbury, B. J., "Production of acetylene gas." Oct. 16.
23,902.—Glover, R. T. & J. G., "Bunsen and like gas-burners." Oct. 16.

Pontefract Gas Company.—The shareholders of this Company last Friday agreed to the issue of £8000 of new capital, being the balance remaining uncalled under the Company's Act of 1873. The maximum dividend on the new shares is 7 per cent.

New Joint-Stock Companies.—The Incandescent Supply Association has been formed with a capital of £1000, in £1 shares, to acquire and carry on the business now conducted at 22, Farringdon Avenue, E.C. The Anglo-Russian Petroleum Company, Limited, with a capital of £120,000, in £1 shares, will adopt and carry into effect a certain agreement; prospect and search for, in Russia or elsewhere, and refine, barrel, store, distribute, or otherwise deal with petroleum, rock oil, coal oil, and hydrocarbons, and all or any of their products; and carry on business as gas manufacturers, &c.

Enlargement of a Stockport Holder on the Wire-Rope System.—Since March last Messrs. Ashmore, Benson, Pease, and Co., Limited, have been engaged, at the Portwood Gas-Works of the Stockport Corporation, in adding two lifts on Pease's wire-rope system to an ordinarily-guided two-lift holder, 160 feet diameter by 32 feet deep. The former capacity of the holder was about a million cubic feet; and the additions have increased it to nearly 2 millions. The crown trussing is now carried on supports; and the pressure of the four lifts is practically that of a three-lift holder with a trussed crown. The work, which has been completed within the last few days, was carried out without removing the water from the tank.

Incandescent Gas Lighting at Bournemouth.—At a meeting of the Bournemouth Town Council last Friday, a report on the use of incandescent lighting was read, in which it was stated that six lamps had been in use since Jan. 18, 1897, and the remainder since March. During that period there were 200 mantles used, being at the rate of about 3½d. per lamp, 12 new bulbs, and 36 forks to replace broken ones, costing about 9s. per lamp for maintenance. It was stated that the lamps were more difficult to clean, and some mantles were broken; others being damaged by vehicles colliding with the lamp-posts, &c. The saving of gas effected per lamp amounted to 4d. per hour for 61 lamps, or a total saving of £18 14s. The illuminating power was nearly three times greater than that of ordinary burners. The report was adopted.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Stevenson's Regenerator Settings.

SIR,—The statement of Mr. F. R. Hislop in your last issue, that the vertical curved division-tile shown in my patent regenerator setting forms part of Mr. G. R. Hislop's patent regenerative settings, is untrue in fact and misleading in intention; implying, as it does, that I have infringed Mr. Hislop's patents. In Mr. Hislop's patent specifications there is no mention of such a tile, nor is one shown on the accompanying drawings. The fact that Mr. Hislop used a similar tile at a later date is no justification for the statement; for in his patented retort setting (1884) no regenerator whatever was included. Mr. Hislop has therefore no right to claim the tile as part of his patent.

I am reluctant to bestow any notice on the communication of Mr. G. Newman, as I cannot suppose he has written with Mr. Winstanley's consent. In order, however, that no misconception may arise, I will say, simply, that in the inclined retort-settings erected from Mr. Winstanley's plans at the Droylsden Gas-Works the firing-hole was not made in the crown of the producer arch, nor were the walls and arch of the producer carried through and forward of the front wall of the setting as in my system. As for the similarity between Mr. Winstanley's tiles and mine, I leave those who are acquainted with Mr. Winstanley's settings to form their own opinion.

Manchester, Oct. 21, 1897. G. E. STEVENSON.

"The Commercial Uses of Coal Gas."

SIR,—The "man of business" is already utilizing the information in this book for a purpose for which it was not quite intended. In stating the work which may be expected from a cubic foot of gas for boiling water, the duty given is extraordinarily low—considerably less than half the theoretical value—for the simple reason that the test was made in a copper kettle, which would hold a gallon, but contained *one* pint of water; and *one* cubic foot of gas was burnt. On a larger scale, it is possible to get double this duty; and I may take some blame for not having stated this. At present the "man of business" is using his opportunity, and telling everybody how much better his burners are—proving, to his own satisfaction, how much he is in advance.

Warrington, Oct. 22, 1897. THOS. FLETCHER.

Sulphate of Ammonia.

SIR,—The questions referring to sulphate of ammonia and its manurial value recently undergoing discussion in your columns are doubtless of no small moment; and accordingly it appears desirable that a subject of the kind should be regarded from as many points of view as possible. Hence I venture to believe a few remarks offered from a chemico-agricultural standpoint may prove not unacceptable.

In the first place, I feel that a slight note of warning is advisable against too marked an emphasis being laid upon the competition existing between sulphate of ammonia and nitrate of soda; for it must be evident to even merely casual readers that a keen, almost implacable rivalry is commonly tacitly acknowledged by writers, if not strongly enforced. Anyone interested in the sulphate industry acquainted with my views—and I would mention as an illustration those expressed in the new edition of "Sibson's Artificial Manures: How to Make, Buy, Value, and Use," in whose revision I had the privilege of taking part—will not be likely to suppose I am at all inclined to underestimate the merits of this fertilizer. Furthermore, those concerned with nitrate, I am equally confident, would scarcely be disposed to believe me guilty of speaking lightly of so valuable a compound as the one they put on the market. Consequently, consistency fully justifies my present contention that, while both salts necessarily fulfil a similar purpose, their manurial functions are certainly not identical; and it is nothing short of lamentable that a wasteful, unscientific policy of pitting one against the other to an excessive degree should prevail.

Obviously one useful object (among numerous others) controlling committees appointed by either trade might well strive to attain, would be to render facts of the kind appreciable to agriculturists; for they are only too liable to imagine manures of any and every description may be employed interchangeably and indiscriminately. Manifestly much has been accomplished in the direction of making nitrate better known; and there is reason to hope that something might be done by an efficient Council or Committee to familiarize our farmers more thoroughly with the excellencies appertaining to sulphate. But to alter its name, as apparently suggested by one correspondent, would, I am convinced, be a mistake; for, under the existing perfectly natural designation, it now enjoys a very wide reputation.

Vendors of both sulphate and nitrate if they wish their productions to remain in favour—that is to say, properly esteemed—should exercise the utmost care to disclaim any intention of desiring purchasers to assume either commodity constitutes a complete fertilizer. If this precaution is disregarded, considerable injury will in all probability eventually ensue; because, although these fertilizers furnish nitrogen (a substance indispensable for crop nourishment), yet it is only one of the necessary elements of plant food, and unless others equally essential—phosphoric acid, for example—are adequately provided, satisfactory results evidently become ultimately out of the question. This point is extremely important, and one nobody concerned can afford to overlook.

23, *St. Mary Axe, E.C., Oct.* 21, 1897. A. E. SIBSON, F.C.S.

American v. English Cast-Iron Pipe.

A correspondent writing from a town in Nebraska (U.S.A.) says: Your remarks in the "JOURNAL" for the 28th ult. (p. 671), on the matter of offering American cast-iron pipe in England, were of interest to me; and I give you prices of cast-iron main pipes delivered here west of the Missouri River, and farther (in cost) from the foundries in Northern Alabama than Liverpool. I have bought more than four miles of the following sizes and prices f.o.b. cars, and expect to lay it all this fall: 12-inch, 8-inch, and 6-inch at $17·25 (say £3 10s. 10d.) per ton of 2000 lbs.; and 4-inch at $17·50 (say £3 11s. 11d.) per ton. This is lower than your lowest quotation. I should expect a better profit to the manufacturer in delivering to Liverpool, *ex* ship, than in delivering here at the same price. I believe our natural resources for the manufacture of iron in all forms are the best now known.

LEGAL INTELLIGENCE.

MONTGOMERYSHIRE QUARTER SESSIONS.

Tuesday, Oct. 5.

(*Before Mr.* A. C. HUMPHREYS-OWEN, M.P., *Deputy-Chairman, and other Magistrates.*)

The Assessment of the Liverpool Water-Works.

This was an appeal by the Liverpool Corporation against the assessment of their water-works within the parish of Llanwddyn by the Llanfyllin Assessment Committee.

Mr. BALFOUR BROWNE, Q.C., and Mr. E. H. LLOYD appeared for the appellants; Mr. F. MARSHALL, Q.C., and Mr. ELLIS J. GRIFFITH, M.P., represented the respondents.

Mr. BALFOUR BROWNE, in opening the case, remarked that what they had to ascertain was what rent would be paid for the reservoir and line of pipes in question; and in deciding this, it must be borne in mind that Liverpool was the only possible tenant of the property. It was fallacious reasoning to base a calculation on the gross receipts which Liverpool received in water-rent, and in assuming that, in order to get the rental value, there must be profits. Mr. W. Marshall, the valuer, had fallen into error through following the Courts. Of course, there was beneficial occupation; and the Court had to determine its measure. The learned Counsel intimated that, as the decision of the Court would only rule in the one county, the appellants proposed afterwards to ask for the decision of the Queen's Bench Division, which would rule everywhere.

Mr. *A. L. Ryde* produced an estimate of the rateable value of the appellants' water-works situate within the parish; his computation of the present effective value of the works being £318,037. This sum the Comptroller informed him the Corporation could borrow at 2½ per cent., which would make the total rateable value £8746.

In cross-examination by Mr. MARSHALL, witness said he had not included in his estimate the improved value of the site. He could not give one case where less than 3 per cent. interest was charged.

Mr. *J. Parry*, M.Inst.C.E., the Water Engineer of the Corporation, gave evidence bearing out the previous witness's estimate.

Mr. *R. Barrow*, Auditor and Comptroller to the Corporation, furnished information regarding the amount of interest at which the money for the construction of the water-works was borrowed.

Mr. F. MARSHALL, for the respondents, said it was true that Mr. William Marshall, the valuer, did not go into the receipts and expenditure except for the purpose of showing that, as a matter of fact, a sufficient sum was collected in the way of payments for water and so forth to cover an adequate rent. The works must be assessed upon an amount proportionate to the rent which the Court considered sufficient, taking all the circumstances into account. The appellants had estimated the land at only £50 an acre. This was a price they would have to pay for agricultural land, before it was improved in any way. But the Corporation had improved it by constructing extensive bridges, and by forming well-made roads; thus facilitating access to the place. The respondents' valuers said there ought to be an addition of £60 per acre on this account. He ridiculed the contention that the amount of interest paid on borrowed money should affect rateable value; and he asked if the Court was expected to sit with every fluctuation of the Money Market. The other side had appealed to the decision of Lord Herschell in the Erith case; but there were two important things to consider in regard to that case. First of all, it was about a large system of sewerage, as to which there was no competitor. Could it be seriously said that in that case similar circumstances prevailed? London had been desirous of obtaining its water supply from Wales; Birmingham had only just obtained a source; Chester was discussing the question year after year; and Shrewsbury was in the same position. All this showed that the Liverpool Corporation were far from being the only possible owners.

Mr. *W. Marshall* said that, in making his valuation, he went into the question of receipts and expenditure in respect to the water undertaking of the Corporation; and in doing so he followed the precedent set by Mr. Ryde's father. He considered the land had increased in value by the roads being made, and also because of the competition for sites. He was quite certain that if the undertaking were put upon the market, it would be immediately competed for by all the big towns round about, and would fetch double the money. The rateable value was very low compared with similar undertakings.

Mr. *J. Cross* entirely agreed with Mr. Marshall's evidence.

In cross-examination by Mr. LLOYD, witness said that, taking the water-works as a whole, he considered the Liverpool Corporation were the only possible tenant, but not merely in regard to the reservoir. He did not doubt the Corporation could borrow the money at 2¾ per cent.

Mr. F. MARSHALL then summed up the case for the respondents.

Mr. LLOYD having replied for the appellants,

The decision of the Court was postponed.

Thursday, Oct. 21.

Judgment was given to-day.

The CHAIRMAN said the Court were of opinion that the value for rating purposes of the property of the Corporation should be ascertained in the following manner: (1) The structural cost of the dam and reservoirs and other works in the two parishes concerned should be taken, as stated by the Corporation, at £646,932. (2) The cost of the land should be taken, also as stated by the Corporation, at £62,250. (3) The annual amount expended by the Corporation on bridges, £9910; roads, £60,181; church, vicarage, and schools, £13,902—total, £83,993—should also be added, as being in the opinion of the Court part of the dam and reservoir; making

a total capital cost of £730,925. (4) The amount of capital cost thus ascertained, which is at present effective, is arrived at by taking the proportion which the daily quantity of the compensation water, together with the daily quantity of the water at present drawn by the Corporation, bears to the total daily capacity of the reservoir—viz., 26½ : 41—£472,427. (5) One-third of the cost of the parts within the parish of the Hirnant tunnel, and of the easement as stated by the Corporation—viz., £9312—to be added to this; making a total effective capital of £481,739. (6) The Court are of opinion that at the present time the outlay on the site and works would, in consequence of the growth of the population, and consequent greater demand for such sites as this, and of the increased cost of labour and materials required for such works, be greater than the actual cost of the site and works to the Corporation; and in consideration of this they think the gross rateable value of the works may be taken at 3 per cent. on the outlay rather than 2½ per cent., the rate at which the Corporation can now borrow. (7) The Court think that the straining-tower should be rated separately from the reservoir in the parish in which it is situated.

The Holophane Globe Patent.

In the Chancery Division of the High Court of Justice last Wednesday, application was made to Mr. Justice Ridley, sitting as Vacation Judge, by Mr. Jessel, on behalf of Holophane, Limited, for an interim injunction to restrain Messrs. Berend and Co., Limited, of Basinghall Street, E.C., from an alleged infringement of their patent glass globes. Mr. Jessel said the defendants had only that morning filed affidavits which it was necessary for his clients to answer. He should therefore ask that the motion should stand over until the second motion day next sittings—the defendants to give an undertaking without prejudice to any question. Mr. Lavington, for the defendants, denied any infringement; but he expressed his willingness to undertake to keep an account of all the alleged infringing globes sold. Mr. Jessel desired a wider undertaking; but eventually his Lordship said the defendants' undertaking would be sufficient. The motion was accordingly ordered to stand over on these terms.

Thefts from Prepayment Meters.

Henry Pagett, who, as mentioned in the "JOURNAL" last week, was committed at the Lambeth Police Court for trial on a charge of stealing from a prepayment meter money belonging to the South Metropolitan Gas Company, was subsequently brought up at the South London Sessions, and pleaded "Guilty." Mr. M'Connell, in summing up the case, said the prisoner had been carrying on a system which he would do his best to put a stop to. He did not say the accused had broken open all the meters; but he would draw his own inference from what he had been told. It was a very serious case, for not only did the prisoner steal the money belonging to the Company, but caused trouble to exist between them and the consumers; and innocent persons were suspected. He did not know that he should send the prisoner to penal servitude; but he would stop short of that, knowing that he was about to give him a severe sentence. He must go to prison for 18 months, with hard labour.

The Voting Rights of Councillors as Shareholders.—The question of the right of members of town councils to vote on questions relating to joint-stock companies in which they are interested as shareholders has lately been submitted to Mr. Kneen, the legal adviser of the Corporation of Douglas (Isle of Man); and he has expressed the opinion that they are entitled to vote. The Town Clerk (Mr. Nesbitt) agrees with this view.

Reductions in Price.—The Driffield District Council have resolved to allow a discount of 20 per cent. to users of gas-engines if 100,000 cubic feet of gas are consumed in a year. Sir Titus Salt, Bart., Sons, and Co., Limited, of Saltaire, who supply gas to their tenants on the Saltaire Estate, have decided to reduce the net price from 2s. 9d. to 2s. 6d. per 1000 cubic feet. The Brandon Gas Company have reduced their price from 5s. 3d. to 5s. per 1000 cubic feet. At Lockerbie the price of gas is to be brought down early next month from 5s. 5d. to 5s. per 1000 cubic feet. At the meeting of the Droitwich Town Council last Tuesday, the Lighting Committee reported that, in consequence of the price of gas having been reduced to private consumers by 4d. per 1000 cubic feet, they had decided to lower the charge for the public lamps from £3 5s. to £3.

The Public Lighting of Liverpool.—Addressing his constituents last Wednesday evening in the Lowhill Ward, Liverpool, Mr. Charles Petrie, the Chairman of the Lighting Committee of the Corporation, gave his audience a general idea of the work which has been accomplished of late in (as he termed it) revolutionizing the lighting of the city. The Committee had, he said, placed 131 electric arc lamps in the streets covering 3½ miles, as well as 1174 incandescent gas-lamps covering 21½ miles; while no less than 522 lamps had been put in back passages, estimated to light 7830 back doors. This he regarded as a most beneficial work for the poorer people, besides which it enabled the police to more effectively keep order. In the secondary streets, 288 additional lamps had been put down, covering a distance of 31 miles; and when the electric trams were obtained, they would be able to place the electric light wherever the tramcars ran. The light would then become cheaper, and consequently would prove a greater competitor to the Gas Company, over which the Corporation had very little control. The Company were strongly hedged round with Acts of Parliament; and the Corporation could only bring the Directors to their senses by opposing them as strongly as possible with the electric light. Moreover, the Committee had effected all these lighting reforms without any extra cost to the ratepayers. In the five years ending 1895, the lighting of the city averaged £40,214; while in 1896, without the added areas, it only cost £35,986. Supplementing Mr. Petrie's remarks as to the electric lighting, it may be added that, at the meeting of the Lighting Committee the following day, the Electrical Engineer reported that, on Sept. 30, the equivalent number of 16-candle power lamps connected with the electrical system was: For private lighting, 54,810; and for Corporation lighting, 5640—making a total of 60,450.

MISCELLANEOUS NEWS.

THE FALMOUTH CORPORATION AND THE GAS AND WATER WORKS.

Revival of the Proposal to Purchase.

The scheme for the purchase by the Falmouth Corporation of the oca gas and water works, which was defeated by a vote of the ratepayers last year, has been revived. Of late complaint has been made that the Water Company do not take sufficient precautions to preserve the water from risk of contamination as it flows through agricultural land on its way to the reservoirs. A good deal of controversy has taken place over this subject; and it culminated yesterday week in a meeting of the Corporation to consider a proposal for the purchase of both the water and the gas works. The Mayor (Mr. C. Deeble) presided. Mr. J. Grose moved—"That a Bill be promoted by the Falmouth Corporation in the next session of Parliament to authorize the Council to supply water purified through sand filters, and to provide for the purchase of the undertaking of the Falmouth Water Company by agreement or otherwise; to obtain powers to borrow and expend the purchase-money for that purpose, and the purchase-money for carrying out (with the ratepayers' consent) the purchase, at any time within the next three years, of the undertaking of the Falmouth Gas Company, under the terms of sections 67 and 70 of the Falmouth Gas Act of 1890, and for other purposes; and, further, that the expenses be defrayed in the first place out of the borough funds or borough rate, and ultimately out of the moneys to be borrowed under the provisions of the Bill." He said the present situation differed from that of last year, because the water now took precedence. The motion did not commit the Corporation to proceed in the next session; and they might take action at any time during the next three years. The price to be paid would be determined by experts if the ratepayers endorsed the principle. Mr. H. Liddicoat, in seconding the motion, said that whoever might be responsible for supplying pure water, the public would force the responsibility on the Corporation, and they ought to be in a position to control it. Both gas and water undertakings should be in the hands of the Corporation. Perhaps the water-works would not be quite profitable at first; but they would prove a good investment if the Corporation had the courage to go on. The gas undertaking would certainly be profitable. Mr. T. Webber was also of opinion that the gas and water supplies should be in the hands of the Corporation. On his suggestion the resolution was amended to read "by sand filtration or other improved method." Mr. G. H. Fox agreed with those who thought it desirable that the water-works should be acquired by the Corporation; but he considered the two undertakings should be separated. He said the acquisition of the water supply might very well be taken up on its merits; but probably the project would be opposed if it was pushed forward in its present form. Dr. Banks coincided with the previous speaker that the two schemes should be separated. He said nothing had happened to lead them to suppose that the ratepayers had altered their minds during the past year; and, though he should vote for the motion, it was with the reservation that the scheme must have the distinct approval of the ratepayers, who this time must show the Corporation the way. On the motion being submitted, six voted for it, one against it, and two were neutral. The absence of several members of the Corporation was commented upon. It was decided to convene a meeting of the ratepayers before the statutory meeting; and it was suggested that, in order to avoid the difficulty which occurred last year, when the opponents of the scheme were said to have packed the meeting, arrangements should be made for a poll of the town upon the question.

LEEDS CORPORATION GAS SUPPLY.

Improved Position of the Gas Undertaking.

In reviewing from time to time the position of the gas undertaking of the Leeds Corporation, we have had to criticize somewhat adversely the system adopted in conducting that important branch of the municipal work. One point upon which we thought the Gas Committee of a few years ago were ill-advised was the employment of separate Works' Managers, without a controlling head. But it may be remembered that about three years since the control of the Gas Department passed into the hands of a differently constituted Committee; and not long afterwards came the appointment of Mr. R. H. Townsley as Superintending Engineer. We expressed at the time our gratification at this step; and it is pleasant to find, from a review of the work of the new Committee and their Engineer, which appeared in the "Yorkshire Post" last Wednesday, that this feeling has been fully justified. The writer of the article boldly declares, in his opening lines, that when the new Committee took office, the gas-works were about the worst equipped of any of their size in the kingdom. In principle and working arrangements generally, the plant was very little better than when the Corporation took it over in 1870. During 1894, such improvements as were possible were effected; but larger opportunities have allowed of full justice being done to the great undertaking which represents so large a portion of the financial liabilities of the Corporation. Under the old management, the point a to whether or not surplus profits on gas-making should be devoted to relieving the rates did not arise, as, unfortunately, there was more often a deficiency than a surplus. The net financial result of the operations in the ten years before 1894-5 was a loss of about £2500. Immediately the new Committee came into possession, they discovered how heavily they were handicapped; and they at once addressed themselves resolutely to the task of bringing all the works into line with the most modern installations of gas-making apparatus in England. They further determined not only to thoroughly overhaul the plant, but also to make the Gas Department a paying business. One of the first reforms initiated was in the main-laying section, the men employed in which had had matters very much their own way. Investigations had scarcely started when it became clear that the Committee ought to be getting more for their money. As the oversight of the staff had been of the slightest

character—the men being left almost entirely to their own devices—a change was made, and all the shops were placed under the control of one superintendent. An extensive wing of the Meadow Lane works, which had been standing empty for some time, was utilized for workshops, show-rooms, and testing apparatus. Thus several scattered departments were centralized under one roof, and brought within the range of one pair of official eyes. The outcome of this reform has answered the highest expectations of the Committee and of all who have watched its progress. Serious attention was also devoted to the stores department, in which for many years great waste had been going on.

But far more important than all the Committee's reforms put together have been the financial results achieved. The outcome of the first year's work under the new *régime* not only enabled the Committee to clear off the incubus they had inherited from their predecessors, but also to start their second year with a substantial surplus. This remarkable stroke of success was repeated, in spite of the facts that the year's income was reduced to the extent of £11,000 by the abolition of meter-rents, and by £6000 more in consequence of a reduction of 2d. per 1000 cubic feet in the price charged for gas. Notwithstanding the two last-mentioned important items of diminution of income, there was a net balance, after paying sinking-fund charges and interest, of about £26,000 in hand. Of this amount, £18,000 was handed over to the city fund, which prevented an increase of the rates; the sum of £10,790 of this £18,000 assisting in paying off the deficits bequeathed to the Committee. In the financial year which ended on the 25th of March last, the Committee had to bear the whole brunt of the reduced charge to consumers, which meant a lessening of receipts to the tune of £19,000 or £20,000. A fall in the value of ammoniacal liquor and tar, and a reduction in the charge for coke, were further sources of diminution of income; and, in addition, the outlay on necessary repairs was very much larger than it had been in previous years. Yet the Committee not only overcame all these disadvantages, and that of the reduction in the price of gas already alluded to, but produced a net profit balance of £7132.

While the Committee have steadily kept before them the importance of supplying good, cheap gas, and of effecting such reforms as the abolition of meter-rents, they have also endeavoured to meet all the reasonable claims of their employees from time to time. Two years ago the gas-making staff worked considerably longer hours in more than one department. The working day in one branch was twelve and in others nine hours. Now a uniform eight-hour day has been adopted. Concessions made to the men amount to no less than £9995 per annum, as compared with the time when gas was 1s. 10d. per 1000 cubic feet and the aggregate result a loss. Before the advent of the existing Committee, deputations frequently went to other towns and cities in search of knowledge as to more modern methods of carbonizing coal. But they produced no result; and it was not until after another deputation, in the early part of 1896, had pursued inquiries with the same object, that energetic steps were taken to provide installations of mechanical stoking at the New Wortley works. This experiment has proved not only to be highly economical, but otherwise a most acceptable substitute for the whole system. Far more important benefits are anticipated from the installation of inclined retorts at Meadow Lane, which will be one of the finest of its kind in the world. It is to start work next January.

The writer of the article concludes by congratulating the Committee and Mr. Townsley on the result of their labours.

ROTHERHAM CORPORATION GAS DEPARTMENT.

The Chairman on the Progress of the Undertaking.

Mr. George Gummer, the Chairman of the Gas Committee of the Rotherham Corporation, opened the municipal election campaign in the town last Thursday, by addressing his constituents of the North Ward. Very properly, a large part of his speech was directed to the work of the Gas Department—more particularly as to its development since the time he became Chairman in 1894. In that year, he said, the number of consumers was 4083, or about one-half of the householders in the borough; but now it was 7910. This advance had been brought about mainly by the introduction of prepayment meters. In 1894 there were only 70 of this class of meter in use; but at the present time there were 3876, and the demand for them still continued. As a consequence, the consumption of gas had largely increased. In 1894 the make was 150½ million cubic feet; whereas this year it was 202½ million cubic feet—indeed, at the present rate of progress, it would amount in the year ending March, 1898, to as much as 230 million cubic feet. The increased consumption, therefore, as compared with 1894, was about 75 per cent. The gross profits of the undertaking had improved accordingly, and had been as follows: 1892, £6458; 1893, £6806; 1894 (the year of the coal dispute), £4404; 1895, £8243; 1896, £9200; and 1897, £10,530. He spoke of the manner in which the officials at the gas-works had discharged their duties, and claimed that they deserved credit for bringing about such excellent results. At the present time the Committee were providing for the present and future increased consumption of gas by the construction of a new retort-house, which, when completed, with twelve beds of retorts, would be capable of turning out an extra million cubic feet of gas per day. This would cost the department something like £13,000. Other improvements had been, or were being, effected. The size of the mains had been increased to meet the demands of the customers, and as a remedy to the complaints repeatedly made with regard to bad illumination. When the new plant was completed, it was assumed there would be a saving in the cost of producing the gas; and he looked forward to the Corporation being able to reduce the price.

The Bolton Corporation Gas and Electricity Departments.—The proposal of certain members of the Bolton Corporation to have a separate Committee for dealing with the electric light undertaking has given rise to a great deal of discussion locally, and also roused much feeling among those at present forming the Gas and Electricity Committee. A special meeting of the Committee was called to consider the matter last Wednesday; and, by the casting vote of the Chairman (Alderman Miles), the proposal was rejected. Those who are in favour of the departments being divided intend to bring the subject forward again.

SALES OF SHARES.

At the Auction Mart, Tokenhouse Yard, E.C., last Tuesday, Mr. Alfred Richards conducted his first sale of gas and water stocks and shares since the recess. Buying was very strong; and there was distinct evidence of an improvement in the market, so far as investors at auctions are concerned. The first lots submitted consisted of some £10 shares (7½ per cent.) in the Southend Gas Company, which were sold at £19 5s. and £20 10s. each; returning the investor at the latter figure £3 13s. 2d. per cent. Ordinary stock of the New Swindon Gas Company, on which 5 per cent. is being paid, but which, under the sliding-scale, is entitled, at the present price of gas, to 6½ per cent. if earned, fetched £125 and £125 10s.; returning at the latter price less than 4 per cent. Some fully-paid new ordinary shares (7½ per cent.) in the Uxbridge and Hillingdon Gas Company were purchased for £18 2s. 6d. and £18 5s. each, *cum div.* from Jan. 1 last. Twelve £50 "C" shares in the Portsea Island Gas Company, on which 12 per cent. is being paid, were bought for £150 each, with the dividend accruing from July 1; returning the investor 4 per cent. Some ordinary stock of the South Metropolitan Gas Company, the last dividend on which was at the rate of 5¼ per cent. per annum, was sold at £146 per £100 of stock; the purchaser taking the half-year's dividend. A unique feature of the sale was the offer of some shares in the Henfield (Sussex) Gas Company—quite an unknown concern established in 1864, and having a share capital on the 25th of March last of only £2000, with £1300 raised on debentures. Twenty £5 shares, on which 2½ per cent. per annum is being paid, were knocked down at £3 7s. 6d. each. The sale included an issue, by order of the Directors, of 500 £10 shares in the Southend Water Company, ranking for a maximum dividend of 7 per cent., though 5½ per cent. is now being paid on similar shares. They were bought at prices ranging from £17 5s. to £17 12s. 6d. each; returning £3 3s. per cent. on the average of £17 8s. 9d.

Apart from the foregoing, only two sales of gas stock call for notice. A few days ago, Mr. W. Hill Forster sold by auction in Norwich seventeen shares in the British Gaslight Company, Limited, for £945 12s. 6d.; being an average of £55 12s. 6d. per share *ex div.* Last Tuesday, Messrs. Garrod, Turner, and Son sold £2500 of new ordinary "C" stock of the Ipswich Gas Company, in £10 lots, which fetched £23 and £23 2s. 6d. each. Mr. J. T. Jolliffe, the Company's Engineer, was a large purchaser of this stock. Messrs. T. Dewhurst and Son held a sale of gas stock at Preston last Wednesday. The first parcel, consisting of £320 of "A" stock of the Preston Gas Company, was sold for £226 per cent.; £554 of "B" stock realizing £180 10s. per cent. At Westhoughton, on Thursday, a few fully-paid £10 "A" shares in the Westhoughton Gas Company were disposed of by public auction for £13 15s. each. On Thursday, Messrs. Waterman and Sons disposed of £550 of consolidated stock of the Maidstone Gas Company. Six lots of £60 of stock realized £125 10s. each; four similar lots, £125 each; one lot of £59 of stock, £125; and another lot of £35 of stock, £84. Some original and new shares in the Gravesend and Milton Gas Company were also sold at prices ranging from £35 to £46 each.

HISTORICAL SKETCH OF THE GAS AND ELECTRICITY UNDERTAKINGS OF BRADFORD.

In connection with the great event of this year, the "Bradford Observer" has been publishing at intervals what they term "Bradford Jubilee Chapters," which have dealt, in a light and interesting way, with the various municipal enterprises which have contributed to the development of the town. Among them the gas and electric lighting undertakings have received very liberal notice; and while space will not permit us to reproduce the whole of the chapters dealing with these important concerns, the most prominent points have been extracted.

The gas-works, we are told, were late as a town possession. They had existed a quarter of a century previously to the Corporation; and twenty years more passed before the question of transfer was discussed in earnest. For one reason, the Corporation had plenty to do in other ways; for another, the Gas Company was not inefficiently managed—the gas comparing reasonably with that of other towns in price and quality. The stimulus to municipal action was outside example rather than popular insistence within the town. What Halifax had done and Leeds was doing could hardly be neglected by Bradford. So, on Dec. 21, 1869, the least busy Committee of the Council, which happened to be the Smoke Prevention Committee (of which Alderman Silas Scott was Chairman), were directed to inquire and report. The Company had spent on the works £96,300, of which one-third was recent expenditure. In exchange for this total outlay, the Directors, with all courtesy, but with a firmness which was evidently immovable, demanded from the town £325,000, cash down. This appears to have somewhat astonished Alderman Scott and the other members of the Committee. They had to admit, of course, that the original cost of any article, and especially of gas-works in a rapidly-growing town, was no necessary criterion of its present value. The quantity of gas made at the works had grown from 225 million feet in 1861 to 490 millions in the year ending June, 1870. The profits for the last-named year were shown to be over £25,000; and they were estimated for the next year at £33,000. Therefore the price demanded was, after all, only ten years' purchase of the latter figure. Further, expert valuation of the works showed that, though the expenditure had only been £96,300, the money, in some mysterious way, had been so bestowed as to produce £250,000 worth of visible property. Inquiry resulted in revelations. In the original Act of the Company, Parliament had provided that any profits in excess of a 10 per cent. dividend should mean a reduction in the price charged for gas. This provision (the writer says) the Company had evaded, or, rather, had utterly and openly defied. Out of revenue, or in effect out of profits which should have gone to the consumer, they had during successive years extended the gas-works, at a total cost of £140,000, or about three times the amount of the shareholders' capital. Thus the creation of £250,000 worth of visible property by an outlay of £96,000 in cash was explained. The gas-works had been mostly built at the expense of the

consumers; and the latter, in their character of ratepayers, were now actually invited to buy, not merely the property of the shareholders, but the property which had been illegitimately taken from the consumers' own pockets.

The Committee reported the facts to the Council on Aug. 16, 1870, and asked authority to seek compulsory power of purchase from Parliament, which authority was immediately given. The Committee and the Directors again met. Admission was made, on the one hand, that the Company in the past had not made profits by supplying worse or dearer gas than that furnished by companies elsewhere; and, on the other hand, that, in consideration of past illegalities, some abatement must be accepted from the first valuation estimate of £325,000. The figures were re-examined; and the worth of the works was estimated thus: £55,000 original capital expenditure; £8707 premiums on shares; £130,000 spent out of revenue; £10,000 borrowed, and repaid from revenue; £32,581 new capital in 1869-70; £29,748 increment in land values—making a round total of £266,000. From this was deducted £56,000 compromise for illegality; making the net price £210,000. The shareholders were called together, and unanimously approved the offer of this sum. Alderman Silas Scott, at the meeting of the Council in December, 1870, urged the acceptance of the £210,000, high as it might appear, inasmuch as the works were nevertheless sure to yield a handsome profit. The Council concurred. In the succeeding parliamentary session, the Bill which embodied this agreement among other things passed practically unopposed. The formal transfer of the works and of the cash took place on July 11, 1871, with many pleasant sayings both from representatives of the Company and of the Corporation. The shareholders, certainly, could afford to be pleasant. Their shares, £25 paid, were quoted when the negotiations began at £53 to £54. At the close of the negotiations, the quotation was £95; this being the precise distributed value of the price paid by the Corporation. The purchase-money was at the rate of £1 8s. per head of the population of the town; while Leeds, only a year earlier, had paid about £800,000—being £3 5s. per head of the population.

One of the most interesting discussions which have taken place at any time in the Town Council was that on the price of gas at the meeting in July, 1872. Under the "monopolistic" private Company, which had been denounced for having a single eye to exorbitant and even illegal profits, the price of gas had been 3s. per 1000 cubic feet. Less than a year had passed of management by the authority when the Smoke Prevention and Gas Supply Committee came before the Council with a proposal to raise the price to 3s. 4d. The intention of the Committee had been noised abroad beforehand. Only one popular opinion found voice; and it was condemnatory, not only of the Committee, but of municipal capacity generally, for commercial management. Somewhat gloomily, therefore, did Alderman Silas Scott address himself to the Council, who speedily manifested their hostility. He almost wished, he said, that the Corporation had never taken over the gas-works. Along with the property they had acquired responsibility for unsettled labour disputes and advancing prices of materials. From these causes the net cost of production had been increased on the lowest estimate by 4d. per 1000 cubic feet. The Committee, after several discussions, had almost unanimously decided that the 4d. must be added to the price; the only alternative being to sacrifice that amount out of the profits. A debate followed, in which the question was very thoroughly thrashed out; and it resulted in the Council voting against the increase by the decisive majority of 24 votes to 11. Fate, however, took the side of the minority, and left no room for argument. The great trade "boom" of 1872-3 sent up the price of coal by "leaps and bounds." Nobody had ventured to maintain that gas should be made and supplied by the Corporation at an actual loss. Besides, wealth was rolling in upon the Bradford trade. So, when the price was after all raised, in 1873, to 3s. 6d. per 1000 feet, no consumer had time or inclination to murmur. Coal soon cheapened; and the trade boom fell away. But by that time the Corporation had been deeply committed to expensive enterprises—including the extension of the gas-works themselves. Responsible members of the Council were glad to have gas profits or any other resources at command in relief of the rates. Therefore the price of gas remained at 3s. 6d. until January, 1876, when a cautious 2d. per 1000 feet was taken off. Two-and-a-half years more elapsed before the original 3s. figure was resumed. Still later, when cheap coal and cheapening gas in other towns caused gas consumers to resume their first agitation, the feeling of the Council remained strongly favourable to high profits and low rates. Furthermore, experience had shown that, by reason of the uncertainty in the prices of chemicals among other causes, the manufacture of gas was a far more speculative business than had once been supposed. Early in 1881 a Sub-Committee recommended a reduction to 2s. 6d.; but the Gas Committee, in deference to the ascertained majority in the Council, rejected the advice. At the Council meeting of February, 1881, however, the recommendation was stoutly supported. The profits for the preceding year, it was pointed out, had been £31,000; and altogether, since the beginning, £180,000 had been drawn from that source, besides interest and sinking fund on the capital. The Council, without coming to a recorded vote, approved the reduction; and the 2s. 6d. scale came into force in the following July, with, at the same time, a revision of the scale of discounts, against which there had been much grumbling. The next and last change was approved in February, 1887. Alderman Priestman, who was Chairman of the Gas Committee, dwelt upon the fact that the profits in 1886, notwithstanding the fall in residual products, had been £18,000, and spoke still more forcibly on the evidence of past experience, which showed that reduced price brought increased consumption. Upon these grounds, the price was lowered from 2s. 6d. to 2s. 3d.; and there it has since remained.

In an Act passed in 1885, the Corporation took power to supply electricity; and early in 1887, the Gas Committee issued 800 circulars to tradesmen and others within a ¼-mile radius of the Exchange to ascertain the nature of the business they were likely to do if they undertook the supply of the new illuminant. Half the recipients replied; and of these one-third declared themselves ready to adopt electricity, while many others were favourably inclined. The Committee sought expert advice and plans from Mr. Shoolbred and Dr. Hopkinson; and sanction for £25,000 of capital was obtained from the Local Government Board. The Bolton Road works were commenced during 1888, and were formally opened on Sept. 20, 1889. A supply equal to half the capacity of the works was at once taken; and the demand grew so rapidly that within a few weeks the Committee came to the conclusion that £25,000 more capital would be wanted. At first the supply was only available within fixed hours—from 10 a.m. to 11 p.m., with an extra half-hour on Saturdays. But by Jan. 28, 1891, an equipment of storage cells had been completed; and a week later the supply was made continuous, day and night, excepting a few hours during Sunday, which were utilized for testing operations. Even this brief Sunday interregnum was abolished at the end of 1895. When the continuous supply had been in operation two years, the demand from consumers had outrun the powers of supply; and in view of the need for extensions and more capital, a Local Government Board inquiry was held on Feb. 21, 1893. After consultation with Lord Kelvin, it was resolved to introduce the "three-wire system;" and in the following year the change was made. The constant additions to the plant have been too numerous to mention. Between 1891 and 1895, the length of electric mains laid in the streets grew from 17 miles to 27 miles; and in the latter year there were, besides the consumers for lighting purposes, fifty motors in use of various powers up to 10-horse. Thus, during last year the necessity for new works became obvious, without taking into account the demands from various districts outside the existing area of supply. The Valley Road works were therefore begun, with an addition of £35,000 to the capital expenditure. As regards price, the charge was fixed in 1892 at 5d. per unit for lighting purposes; and for motive power at 4½d., which was reduced in 1894 to 3½d., and in January of the present year to 2½d.

Some miscellaneous events in the records of the Gas Committee are next noticed. Extensions of the gas-works were among their earliest responsibilities, and were accompanied by varied troubles and changes of plan. The Birks House estate was acquired in November, 1872; and in 1875 powers were taken to obtain £200,000 of capital to put up works at Laisterdyke and Brownroyd, and to dispose of the Mill Street and Thornton Road works—the latter an intention not carried out. In 1877 Mr. T. Hawksley was consulted; and the Birkshall works were begun. But for various reasons, it was not until November, 1883, that the supply from this quarter was available. Upon the numerous enlargements and extensions at the other centres of supply, it is needless to dwell. The addition of the outlying district of Bolton to the borough in 1873 necessitated an arrangement with the Shipley and the Eccleshill Gas Companies as to the gas supply in the annexed area. It is curious to note that, while the House of Commons, in passing the Corporation Bill dealing with the subject, recognized the vested interests of these Companies, the House of Lords, before which the Bill first came, had seen no necessity for compensating them beyond the actual dead valuation of their pipes and other property as taken over. The Shipley Company claimed £2000, and obtained £1800; the Eccleshill Company asked £5400, and received £3500. The further additions to the borough in 1882 brought about a similar complication with the Clayton Gas Company, which is not yet settled. An accident at the Clayton works in 1883 was made the opportunity for an offer from the Bradford Corporation to take over the works; but this was declined. Again in 1890 the Corporation offered either to buy out the Company or take gas in bulk at the Clayton price, and sell it at the lower Bradford price; but this offer was also refused. Negotiations opened again this year had an equally abortive result.

The chemical department of the gas-works has had an adventurous history. In 1868 the Gas Company made a contract disposing of the tar products, which were then regarded as insignificant, for a lump sum of £850 per annum, irrespective of quantity. The contract was continued under the Corporation until 1878. Then an arrangement was made with Mr. D. V. Steuart, who contracted for seven years to pay 2s. 5½d. per ton for the bye-products. This was supplemented by another contract in 1881 for the supply to the gas-works of oxide of iron free, on further condition that the contractor received it back, when saturated with the sulphur from the gas, for 10s. per ton. In 1883 Mr. Steuart became insolvent; and the Gas Committee set up as manufacturers of chemicals, after purchasing Mr. Steuart's works for £9080. Though not associated with the chemical department, the extraordinary controversy which arose in 1895 as to the Dvorkovitz process of "enriching" gas by the addition of oil vapour is here mentioned. The merits of the process were obviously a matter for expert decision only; but, for some reason, the Council divided itself *pro* and *con.* on political party lines. In form the question is still unsettled and under consideration by the Committee; but it has not been revived since the debate in the Council at the September meeting in 1895.

A memorable incident was an explosion at the Thornton Road works, on Nov. 22, 1879, which resulted in two deaths, and left portions of the town in darkness during the winter nights until a main had been laid to bring up a supply from Valley Road. Then on Dec. 3, 1891, the Valley Road works themselves were the scene of an explosion, which was, however, of less disastrous consequence. A catastrophe of another kind was the discovery, in 1884, of the frauds by W. S. Whitehead—the loss, however, of £4200 being repaid, with costs, out of Whitehead's property.

Since the acquisition of the gas-works, the lighting of the streets has been under the charge of the Gas Committee; and the cost of the gas (supplied free to the lamps) has always had to be taken into account in estimating the true profit-and-loss position of the works. Improvements in the lighting have been continuous. The number of street-lamps in 1882 was 5000, and has since been increased by one-half.

The capital expenditure on the gas-works, including the original purchase-money, stands in the last-issued statement at £618,947; and the profits available or paid over in relief of the rates from the acquisition of the works in 1871 to March, 1896, have been £403,730.

Upon the electricity works the capital outlay to the same date was £76,802. Up to March 31, 1891, the loss was £1739. The total profit in the five following years was £10,296; leaving a net profit, since the commencement, after allowing £2636 for depreciation, of £5921.

As regards management, it was a condition upon the purchase of the gas-works that Mr. David Swallow, who had been Manager under the Company, should continue at the post. He retired in 1890, after a total service of sixty-seven years under the Company and the Corporation. His successor was his assistant, Mr. W. Wood, the present Manager.

Meters, Limited.—The first batch of letters of allotment and regret have been posted.

ELECTRIC LIGHTING NOTES.

On the night of the 17th inst., Dover was again plunged in darkness, owing to the failure of the electric light. This time the collapse was attributed to an accident to the water supply at the works rendering it impossible to fill the boilers.

The Shoreditch Vestry are erecting some palatial flats for the working-classes. In connection therewith, Dr. Robinson, the Vestry Clerk, is reported to have stated that they were going to fit up the tenements with penny-in-the-slot electric meters, as the electric light could be supplied cheaper than gas, owing to the Vestry having their own plant. This will be an interesting experiment.

A recent number of the "Melbourne Argus" contains reports of fatal accidents which have occurred in the Colony in connection with installations of the electric light. One Saturday night a youth climbed an electric lighting pole by way of a challenge in gymnastics to his two companions, when he thoughtlessly took hold of the wires and received a fatal shock. At the Richmond works of the New Australian Electric Lighting Company, whose wires were concerned in the above-mentioned accident, a workman or overseer was killed instantly through touching a live wire. A third and even more remarkable case than the others occurred a short time ago. There had been a violent storm, and a post carrying electric lighting wires had been blown to the ground. In the fall, some of the wires broke, and trailed across the footway. A pedestrian idly picked up the broken end of one of these wires, and in a moment he was seen kicking and plunging upon the ground, unable to release his hold of the wire. Another pedestrian who saw the incident, and who recognized that it was a struggle with death, hastened to the rescue, and attempted to drag the first man into safety. In doing so, he completed the circuit, and was killed on the spot.

The Hampstead Vestry are again in terrible trouble. The contractors ought to have delivered the additional electric lighting plant some ten months since; but they have failed to do so. The Electric Lighting Committee are therefore in a quandary, and have thought it best to instruct the Vestry Clerk "to advise all consumers not to press the load between 6 and 8 p.m. each week-day during the present emergency." When the Committee reported this at last Thursday's meeting, there was some little excitement. Mr. Richardson waxed indignant over the fact that the Vestry had that evening paid £1000, on their own Engineer's certificate, to these very contractors - a scandalous thing, he thought, when through their delay the Vestry were in the humiliating position of asking their own consumers not to use too much current; as, if they did so, there must be a breakdown in the machinery. He hoped the Vestry would not fail to enforce the penalties forfeitable by the contractors for their delay—a trifling amount of £800 or thereabouts. He moved that in future the Engineer should withhold his certificate for electric lighting works until the Vestry had decided that payment ought to be made. A long discussion followed—some members attributing the delay to the engineers' strike—though the plant was due months before the commencement of that trouble. In the end, the motion was carried by a large majority.

It will be remembered that a short time ago an intimation was given to the Lewes Town Council by a private gentleman of his intention to apply for a Provisional Order for establishing an electric light undertaking in the town. Thereupon the Directors of the Gas Company, as already recorded (*ante*, p. 536), approached the Council, and arranged that, if they would oppose the application, and themselves apply for an Order, the Company would indemnify them, on condition that the Order should be handed over to the Company. It appears, from what transpired at the meeting of the Council last Wednesday, that this offer was not accepted, nor was consent given to the application emanating from a private source. Under these circumstances, the Council were forced to move in the matter; and accordingly a motion was submitted by Mr. Gates, as Chairman of the Finance Committee, that an Order should be applied for by the Council. Objection was raised to this by Mr. Savage, on the ground that the electric light would not pay in a small place like Lewes, and that if they were not relieved of the Order after spending £400 to get it, they would have it "round their necks." Mr. Holman supported the motion, because the Council should not, he said, take up the position of the dog in the manger. If they had had no intention of applying for an Order, they should not have debarred other people from coming in and doing so. After some discussion, the motion was carried *nem. con.*; only the mover and seconder voting for the amendment.

The appearance on the *agenda* paper for a meeting of the Peterborough City Council of a motion referring to the electric light has, ever since the Corporation obtained their Electric Lighting Order, been the means of ruffling the tranquillity which usually reigns at the Guildhall, and what has happened before happened again last Wednesday. A proposal was made by Mr. Batten that the Council should sell the Order on the best terms that could be obtained. But to thus dispose of their hard-fought-for Order was too repugnant a step for some of the members to take; and the suggestion led to "a scene." From Mr. Batten's remarks, it appeared that there were two companies who were anxious to speculate; and he thought they ought to be given an opportunity. He was convinced of two things: First, that electric lighting could not pay in the hands of the Council for a number of years. Secondly, that there were many demands at present on the ratepayers' purses; and he knew that the great majority of the ratepayers were desirous of his proposition being passed. An amendment was moved to the effect that the Corporation retain the powers vested in them. For a short time the debate proceeded smoother, until a reference to some statements made by Mr. Batten in Committee caused that gentleman to protest. Mr. Batten was ruled out of order by Alderman Barrett, who was presiding; but he refused to submit. Amid great disorder, Alderman Barrett vacated the chair; but on Mr. Batten resuming his seat, the discussion was proceeded with, though still in a lively strain. The motion was rejected by twelve votes to eight. The successful opponents afterwards passed a resolution, of which notice had also been given—"That the Council apply to the Local Government Board for sanction to borrow £15,000 for electric lighting works, and that street lighting be not included in the scheme." It remains to be seen whether the ratepayers will again convince the Local Government Board that the money to be asked for could be spent to better advantage in other directions.

METROPOLIS WATER SUPPLY.

The Quality of the Water during September.

The uneasiness produced all over the country by the epidemic of typhoid fever at Maidstone—resulting, as there is good reason for supposing, from a polluted water supply—and the notification of a few cases in London, have caused more than ordinary attention to be given to the analyses of water which are now periodically furnished, and the institution of these safeguards to the public health where they have not hitherto existed. We have repeatedly alluded to the vigilance exercised over the water supply of the Metropolis, the examination of which is not entrusted solely to experts engaged by the Water Companies—who, nevertheless, are gentlemen of the highest scientific attainments—but is likewise in the hands of the official Water Examiner (Major-General A. de Courcy Scott) and Sir Edward Frankland, F.R.S. In a time of panic, however, the most reassuring statements coming from parties who are supposed to "hold a brief" for the Companies are liable to be discredited, and the value of their labours depreciated. It may therefore be interesting to reproduce some remarks made by Sir William Crookes and Professor Dewar in their report to Major-General Scott on the quality of the London Water Supply during the past month. After recording that the 182 samples of water examined by them during September were all found to be clear, bright, and well filtered, they say:

"In order to prevent any misapprehension in the public mind with regard to our monthly reports on the quality of the London waters, it may be advisable to repeat that the Water Companies in no way interfere with our position as absolutely independent scientific authorities. Further, they have no information, antecedent to publication, as to what will appear in our report. Our communications with the Companies are chiefly confined to calling their immediate attention to the least anomaly appearing in the character or the quality of the filtered water; our chief aim being to advise the Engineers at the works as to the efficiency of storage and filtration. There is no city in the world where such minute and incessant care is taken daily and almost hourly to detect and report on the slightest deviation from purity in its water supply. The following table shows that the water supply of last month was actually in a higher state of purity than it was in the corresponding month of last year [the figures in the first line being for September, 1896; in the second for September, 1897] :—

Common Salt. Per Gallon. Means.	Nitric Acid. Per Gallon. Means.	Hardness. Degrees. Means.	Oxygen reqd. Per Gallon. Means.	Organic Carbon. Per Gallon. Means.	Organic Carbon. Per Gallon. Maxima.
2·228 ..	0·834 ..	13·41 ..	0·048 ..	0·087 ..	0·146
2·137 ..	0·836 ..	14·25 ..	0·034 ..	0·087 ..	0·104

"Our bacteriological examination of 255 samples taken by us have given the following results. We have also examined 9 other samples, from special points, making a total of 264 in all:—

	Microbes per Cubic Centimetre.
Thames water, unfiltered (mean of 26 samples)	98,485
Thames water, from the clear-water wells of five Thames-derived supplies (mean of 126 samples)	72
Do. do. highest	992
Do. do. lowest	2
New River unfiltered (mean of 26 samples)	387
Do. filtered (mean of 26 samples)	26
River Lea, unfiltered (mean of 26 samples)	3,168
Do. from the clear-water well of the East London Company (mean of 26 samples)	36

"Apart from the daily bacteriological examination of the clear-water wells of the Companies, we frequently make specific tests for the presence of pathogenic organisms. If any other than a negative result had been obtained, the fact would have been recorded. It will be observed in the above table that there was an occasion in which the microbes rose to far above the average. This was quite exceptional, and was connected with the atmospheric conditions following an unusually violent thunderstorm, when 1·13 inches of rain fell in less than an hour. We are in a position to say these microbes were harmless."

THE EPIDEMIC OF TYPHOID FEVER AT MAIDSTONE.

Disinfecting the Water Reservoir and Mains—Dr. Sims Woodhead's Views—An Auxiliary Water Supply.

In the "JOURNAL" last week, it was mentioned that the reservoir and mains connected with the Farleigh water supply at Maidstone had been disinfected with chloride of lime, under the personal supervision of Dr. Sims Woodhead, who has been called in by the Directors of the Water Company to give them the benefit of his advice in their present difficulty. The necessity for resorting to such an operation as disinfecting a town's water-supply system is, fortunately, of rare occurrence; and it may therefore not be out of place to give Dr. Woodhead's views on the subject generally, as communicated to a Press representative during the operations on the night of the 16th inst. He commenced with the reassuring statement that there was no possible danger of typhoid germs remaining in the water-pipes after the completion of the process. The only organisms that could exist for any length of time in chloride of lime were the spores of anthrax, with which they had not to deal. In his opinion, there was not sufficient danger of infection in the mains to render the disinfecting process absolutely necessary; but, at the same time, it was a very politic thing to do if there was a possible one chance in ten thousand of infection remaining. The Company were therefore disinfecting the reservoir and mains—first, as a precautionary measure, and, secondly, to reassure the public. He did not think the new cases of typhoid then arising in the town were due to the water supply. The danger of infection from this source, he believed, ceased with the cutting off of the polluted water and the flushing of the mains. Asked whether he knew of any town in the kingdom where a similar disinfecting process had been carried out, Dr. Woodhead stated that at Worthing quicklime was used, and allowed to remain in the pipes, he believed, three or four days.

Chloride of lime, which, so far as he knew, had not before been used anywhere in the country, was surer and quicker in its effects. The typhoid bacillus, Dr. Woodhead further said, might remain alive for one or two weeks in water. Its period of existence would depend upon what was in the water and the state of the temperature. Water, however, was not a favourable medium for the multiplication of the bacilli unless there was something added to it. Under the then prevailing conditions of the Maidstone water supply, the typhoid germ, if present, would not be likely to remain in existence very long. Referring to the controversy as to how the typhoid bacilli might have been introduced in the Tutsham Spring of the Company, Dr. Woodhead said it was not likely that such pollution would arise from the highly cultivated land in the neighbourhood of the spring. So far as was known, there could be no typhoid germ without a pre-existing case of typhoid, and, of course, there could be no case of typhoid without a pre-existing germ. How the germ first came into existence, however, could not be traced. With regard to the anxiety of the public of Maidstone as to the sewer manholes at the present time, Dr. Woodhead thought it very improbable that any cases of typhoid would occur in consequence of the gas arising therefrom; nor would diphtheria be likely to follow the typhoid epidemic as a result of such sewer gas. The typhoid germ was not likely to get into the atmosphere from the sewers, because it always clung to moist objects. In a half-dried state it might be carried about in dust; but it did not float very long in the air, for the simple reason that light would be fatal to it. Experiments had conclusively proved that the direct rays of the sun would kill almost any disease germ in a few hours. On the question of the possibility of detecting by chemical analysis pollution of water by typhoid bacilli, Dr. Woodhead added that, in the case of the Tutsham Spring, if the water were analyzed separately there might be sufficient extra organic matter discovered to draw special attention to it. If, however, the analysis were made in the usual way when the Tutsham water had become mixed in the reservoir with that from other springs, this amount of extra organic matter might be so infinitesimal as to fail to attract special notice. Yet the pollution of the water might be sufficient to cause such mischief as had arisen at Maidstone. Even with regular bacteriological analysis, the typhoid germ could not be discovered without several days' research. It was possible that pollution such as was supposed to have occurred at Farleigh might arise in one day following a shower of rain. It would depend upon the quantity of water pumped from the spring, and its immediate distribution or otherwise; but it was quite possible that the pollution might do nearly all its mischief before being bacteriologically ascertained.

Recording briefly the progress of events in connection with the epidemic since our last issue, the first matter calling for mention is the restoration of the water supply on the morning of the 18th inst., after the disinfection; and the completion by Messrs. John Aird and Sons of the connection between the Maidstone Water Company's mains and those of the Mid-Kent Company, whereby a large additional quantity of water was available for the inhabitants of the town. Owing, however, to the great waste resulting from the disinfection process, the full benefit of this auxiliary supply was not immediately felt. In accordance with the decision come to, the District Council addressed a letter to the Local Government Board, stating that they thought a public inquiry into the circumstances of the outbreak of typhoid fever was most desirable, and that they purposed making a fresh application to the Board when the present emergency had passed. In reply, the Board said they had previously been of opinion that the holding of an inquiry would have seriously interfered with the action of the Council and their officers; but that, if the request were renewed, there would be every desire on the part of the Board to meet their wishes in the matter. Mr. John Arkcoll, one of the Directors of the Water Company, who was recently asked to accept the office of Mayor of the borough for the ensuing year, has written to the Chairman of the Conservative party of Maidstone to the effect that, under the exceptional circumstances, he must decline to entertain the request. At the meeting of the District Council last Wednesday, the Town Clerk (Mr. H. Monckton), who is a Director of the Water Company, intimated that if any issue arose between the Council and the Company in connection with the epidemic, and it became necessary to take legal advice, it would be impossible for him to act for the Council; and he should not hesitate in asking them to appoint a solicitor independent of himself. The Medical Officer of Health (Mr. M. A. Adams) presented his monthly report, and stated that, in accordance with instructions, he had made analyses of the three water supplies of the town—the conduit, the Boarley, and the Cossington waters. From a study of the results, he was of opinion that, having regard to the season of the year, all the waters were good and wholesome. Complaints were made by several members that the disinfection had been incomplete; none of the solution of chloride of lime having passed through their taps. Owing to the condition of the town, the next assizes are to be held in Canterbury; and for the same reason the West Kent Quarter Sessions were opened last Thursday in the Guildhall, Westminster, instead of at Maidstone. Up to Saturday last the number of deaths resulting from the epidemic was 104; the number of recorded cases being 1727. The sanitary authorities consider the epidemic is now well under control. The relief fund amounted at the close of last week to £13,400.

THE LOCAL GOVERNMENT BOARD AND WATER DIVINERS' FEES.

It will be remembered that a short time ago (*ante*, p. 275) Mr. A. W. Dolby, one of the Auditors of the Local Government Board, disallowed the fees paid to a water diviner employed by the District Council of Porthcawl, in Glamorganshire, in connection with some boring experiments carried on by them. It appears that the Council have decided to appeal against this decision; and, with the view thereto, Mr. Dolby has stated his reasons, as follows:—

In the accounts for the year ended March 31, 1897, of the Porthcawl Urban District Council, I disallowed the undermentioned sums for the following reasons: As to the sum of £3 8s., this was entered and charged as paid to R. W. Robertson, a water diviner, for "services rendered;" and I disallowed the same (1) because, in my opinion, the action of the District Council in seeking the services of a water diviner, and in paying his fee and expenses, were not such proceedings as were authorized by any statutory enactment under which the Council were empowered to provide a water supply for their district; (2) because, instead of seeking skilled advice, the Council had called in a person who claimed to possess some supernatural power of finding water, and who made pretence to a power within the meaning of the decision given in *Regina v. Giles* (34 L.J., M.C. 54); and the arrangement or agreement with him was therefore void in law, and the payment to him illegal; (3) because this water diviner made pretence to discover by divination the existence at certain spots below the earth's surface of supplies of water, and agreed for a consideration to employment by the Council, and, without possession of knowledge as to the existence of water, he took upon himself to represent a certain state of things—viz., that water would be found at certain spots indicated by him. If I rightly apply to this case the decision given in *Evans v. Edmunds* (13 C.B. 777), that "if a man having no knowledge whatever on the subject takes upon himself to represent a certain state of facts to exist, he does so at his own peril, and if it be done with a view to secure some benefit to himself he is guilty of fraud," the water diviner in this case was guilty of fraud—he having, by professing to possess certain powers of divination enabling him to locate hidden supplies of water, induced the Council to employ and pay him. Being guilty of fraud, the arrangement or agreement with him was void in law, the amount claimed by him was not lawfully recoverable, and the payment to him by the Council was illegal. As to the sums, amounting to £128 15s., which represent the expenditure charged upon the general district fund arising out of the action of the Council in following the advice given, or adopting the suggestions made, by the water diviner, I disallowed the same (1) because I considered, upon the evidence before me, that the Council were not justified in embarking upon the expenditure represented by the sums disallowed, upon the unscientific and speculative advice of the water diviner, and that they incurred and defrayed this expenditure in boring, &c., for water without taking reasonable or proper steps to ascertain the geological features of the locality, and the likelihood of getting water there; (2) because, in view of the fact that the employment of the water diviner was illegal, I considered that the Council undertook the work of boring, &c., and incurred the expenses disallowed, without having a competent adviser legally employed, and that their action to this extent was culpable and reckless, and was calculated to lead to a waste of the public funds entrusted to them; (3) because I came to the conclusion, upon the evidence before me, that the said expenditure was a reckless waste of public funds, for which I have, by process of surcharge, properly held accountable those members of the Council who were responsible for the actual payment of the sums disallowed.

The Sleaford District Council a short time ago applied to the Local Government Board for power to raise money for water-works purposes, in connection with which money had been expended in obtaining the assistance of a water-finder. The Board have granted the loan; but they have declined to include the fees paid to the diviner. The Council have therefore decided to pay them and the costs apart from the loan.

THE LISKEARD CORPORATION AND THE WATER-WORKS.

The scheme for the purchase of the Liskeard Water-Works by the Corporation, which has been under discussion for some months, seems now likely to be carried out. Practically, the only difficulty which has stood in the way is that of the sinking fund. It was calculated that, if only thirty years were allowed for the repayment of the cost of the undertaking, the present revenue would not suffice to meet the annual charges for principal and interest; and a good deal of discussion and correspondence has taken place, with the object of ascertaining what prospect there is of the period being extended. A conclusion which is considered satisfactory has at last been arrived at. The Committee who have had the subject under investigation report that the Local Government Board cannot entertain the application of the Town Council for a loan for the purchase of the works, because the limits of supply of the Company extend beyond the borough of Liskeard. The only course open to the Council, therefore, is to promote a Bill. The Directors of the Company are willing to allow the Council to purchase as from Dec. 31, 1898, under parliamentary authority, and to contribute £100 towards the cost of obtaining the Act, provided the necessary powers are sought to enable the Company to be wound up. This, add the Committee, would mean that repayment of the purchase-money—£16,500—would probably be extended over sixty years; and the money might be borrowed at not more than 3 per cent. The cost of the Act—£650—would be repayable in two years. Including maintenance the total cost to the Council in this period would be only £844 per annum, and £780 a year during the remaining fifty years; while the income of the Company is at present £875, and is annually increasing. The minimum profit for the first ten years would thus be not less than £30 a year, and for the remainder of the term of repayment £94 a year; while afterwards the town will benefit annually to the extent of a clear £700. They therefore recommend: (1) That the offer of the Directors of the Water Company be accepted: (2) that steps be at once taken to promote a Bill; and (3) that the Parliamentary Agents be instructed to prepare the necessary formal resolution to be submitted to the Town Council at a special meeting to be convened in accordance with the Borough Funds Act. The report was submitted to the Town Council, sitting as an Improvement Committee, on the 15th inst., and was unanimously adopted; and steps are to be taken to carry the recommendations into effect forthwith.

The Kidderminster Corporation and the Gas-Works.—The Kidderminster Gas Company have declined to sell their undertaking to the Corporation on the terms offered—viz., a guarantee of the Company's maximum dividends for 20 years, and then buy the works at 25 years' purchase.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The municipal election fever is at its height this week. All over the country beaming candidates narrate the successes of their pet schemes in the past, or hold forth bright hopes for some dazzling object in the future—frequently both. There are so many municipal gas undertakings in Scotland, that it goes without saying that one cannot, at present, lift a newspaper without coming upon a passage by a town councillor somewhere, telling how great an advance has been made in the matter of gas supply since he first became acquainted with the undertaking. It is significant that they all have to speak of advance, and none of decay. Most of the narratives which are being given have already appeared in the "JOURNAL," and are not much more than a re-hash of the annual statement by the treasurer of the undertaking. As such, they are not of much moment to us. But in three places questions relating to gas supply are prominently before the electors, if they are not actually electoral test questions. These places are Edinburgh, where the proposal to remove the gas-works to a new site has been made; Dundee, where the Corporation are obliged to face a considerable outlay on the extension of the gas-works; and Stirling, where the foolish opponents of the gas transfer are endeavouring to get the community to ratify their action.

In the Edinburgh case, I am amused at the straining there is to reach the position of being able to make the people believe that the notion of removing the gas-works is no new one to the speakers. According to themselves, they have all been thinking on the subject; but it would seem that no one had the courage to speak out until Sir William Arrol did. All are in favour of the removal, though—and there is there room for further amusement—not one of them knows anything about how a financial scheme could be framed for the working out of the proposal. That is a phase of the subject which seems to be ignored. Of course, a great deal depends upon the cost of the new site and the value of the old one; but a person who is acquainted with values in and around Edinburgh could as easily estimate those two items as can a housewife the cost of to-morrow's breakfast. It lies with Mr. W. R. Herring, the Engineer to the Gas Commissioners, to formulate a detailed scheme; and this he will be able to do when he is called upon. But a scheme in outline would not interfere with a subsequent detailed one; and it would have the effect of showing that the speakers understand what they are talking about, and enabling the community to know what is before them. To speak frankly I believe that hardly any one of the municipal candidates knows more than that the thing must be feasible because Sir William Arrol has spoken of it; and the community naturally know less.

There is one man—Councillor Waterston, a member of the Gas Commission—who does not scruple to speak his mind. He is rather outspoken, as we know; and it is not always possible to agree with him. On this occasion, however, it is possible. He is representative in the Town Council of the Canongate Ward, in which the Edinburgh Gas-Works are situated. The electors held their annual meeting on Thursday night, Mr. Waterston presiding. He said that before he entered the Town Council he advocated the removal of the gas-works for the reason that, so long as they remained where they were, they were at the mercy of one railway company—a railway which was managed by about as clever a race of gentlemen as had ever been produced. Proceeding, Mr. Waterston said it was a sad commentary on municipal life, that they never knew they needed a change in their works till they got a new Engineer. Before they erected the new chimney, he advocated, in the Gas Commission, that it was an unnecessary expense, because they would have to remove. But they were advised by their Engineer that, by some slight improvement, they would be able to meet the demand for gas for the next fifteen years. Scarcely was the chimney built, when they were told that this was altogether impossible. This is plain speaking of Mr. Waterston's; but it is true. I must say, however, that nobody regretted more than did the late Mr. Mitchell that he was obliged to remain where he was; and I verily believe that, had he imagined his advice would have been listened to, it would have been, years ago, "Remove at once."

Another point before I leave Mr. Waterston—and a point, too, upon which I feel it more remarkable that he and I should agree. One of the candidates for the Canongate Ward is a Socialist, who maintains that there should be a municipal workshop. On this subject Mr. Waterston, though an advanced Radical, does not see eye to eye with the Socialists. Here is how he expressed himself: "We had the question of the repair of meters in the gas-works before us. We tried it; and the reports we have got showed that there was a considerable increase in the amount paid within the works over what we had paid for the work done outside. I want to ask my Socialist friends if they are prepared to ask the Gas Commission, or to go on to the Gas Commission, and to vote away a considerable sum of money to keep a municipal workshop going in the gas-works, seeing that the work can be done cheaper outside? While I am largely in favour of municipal work, and of an eight-hour day, if it is to involve the turning off of old men, and a heavy increase of the rates, I must come to my constituents and ask their direction." It requires some reflection to grasp this speech aright. It was an election speech, which makes it the more remarkable, because it is usually on such occasions that the most bewitching of promises are made. But, on reflection, it must be conceded that Mr. Waterston was right. He well knows that only a very small minority of the electors are Socialists; and while he may talk, on other occasions, in a general way, in support of their tenets, at a serious time like an election it is the wise man who does not hold out promises which he knows he cannot fulfil. He has left a beautiful way of escape for himself, should he ever be taken to task for not supporting any Socialistic proposal. Wise man, Mr. Waterston.

In Dundee, the suggestions for the extension of the gas-works are not being taken up heartily. There is an apparent shrinking from the duty of urging the right in this matter. The community, it is evident, do not relish large outlays. What is needed is a strong man in the Town Council who will lead them upon questions of gas supply, and not throw it altogether upon the experts in their employment to push a scheme of extension. The drawback to the latter policy is that any scheme which may be adopted is likely to be only a half one; whereas if the Council take the matter up themselves, and respond to the skilled advice they

GAS AND WATER COMPANIES' STOCK AND SHARE LIST

Referred to on p. 890.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 14	10½	Alliance & Dublin 10 p. c.	24—25*	..	4 4 0
100,000	10	„	7½	Do. 7 p. c.	16¾—17¼*	−½	4 5 8
300,000	100	July 1	5	Australian 5 p. c. Db.	106—108	..	4 12 8
200,000	10	May 27	7	Belgrano (B. Ayres), Ltd	10½—10¾	..	6 10 3
100,000	Stk.	June 29	5	do. 5 p. c. Db. Stk.	107—110	..	4 10 11
200,000	5	May 27	6½	Bombay, Ltd.	6¾—7¼	..	4 9 7
40,000	5	„	6½	Do. New, £4 paid	5½—5¾	..	4 10 7
380,000	Stk.	Aug. 27	12	Brentford Consolidated	300—305	..	3 18 8
240,000	„	„	9	Do. New	225—230	..	3 18 3
50,000	„	„	5	Do. 5 p. c. Prf.	145—150	..	3 6 8
159,375	„	June 11	4	Do. 4 p. c. Db. Stk.	135—139	..	2 17 6
220,000	Stk.	Sep. 15	11½	Brighton & Hove Orig.	273—278	+3	4 2 8
208,820	„	„	8½	Do. A. Ord. Stk.	200—205	..	4 2 11
933,500	Stk.	Aug. 27	5	Bristol, 5 p. c. max.	130—135	..	3 14 1
420,000	20	Sep. 30	11½	British	56—57	..	3 18 11
50,000	10	Aug. 27	11½	Bromley, Ord. 10 p. c.	25—27	..	4 5 2
71,000	10	„	8½	Do. 7 p. c.	20—22	..	3 17 3
500,000	10	Oct. 14	6	Buenos Ayres (New) Ltd	10—11*	..	5 9 1
98,122	Stk.	—	4	Do. 4 p. c. Db. Stk.	98—100	..	4 0 0
150,000	20	July 15	8½	Cagliari, Ltd.	30—32	..	5 3 1
100,000	10	Sep. 30	8	Cape Town & Dis., Ltd.	17—18	..	4 8 11
50,000	50	May 3	6	Do. 6 p. c. 1st Mort.	60—61	..	4 18 5
550,000	Stk.	Oct. 14	13¾	Commercial Old Stock	340—345*	..	3 18 3
196,483	„	„	10½	Do. New do.	255—260*	..	4 0 9
196,300	„	June 11	4½	Do. 4½ p. c. Db. do.	155—158	..	2 16 11
800,000	Stk.	June 11	13	Continental Union, Ltd.	257—262	..	4 19 3
200,000	„	„	10	Do. 7 p. c. Prf.	217—222	..	4 10 2
51,600	Stk	Aug. 27	14	Croydon A 10 p. c.	315—320	..	4 7 6
163,400	„	„	11	Do. B 7 p. c.	252—257	..	4 5 7
535,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	137—140	..	3 15 0
60,000	„	„	5	Do. 5 p. c. Prf.	140—143	..	3 9 11
486,090	10	July 29	11	European, Ltd.	25¼—26½	..	4 3 0
354,060	10	„	11	Do. £7 10s. paid	18—19	..	4 6 11
5,896,590	Stk.	Aug. 12	12¾	Gaslight & Coke, A, Ord.	313—316	−3	4 0 8
100,000	„	„	4	Do. B, 4 p. c max.	113—118	..	3 7 10
665,000	„	„	10	Do. C, D, E, 10 p. c. Prf.	317—322	..	3 2 2
30,000	„	„	5	Do. F, 5 p. c. Prf.	150—155	..	3 4 6
60,000	„	„	7½	Do. G, 7½ p. c. do.	220—225	..	3 6 8
1,300,000	„	„	7	Do. H, 7 p. c. max.	203—208	..	3 7 4
463,000	„	„	10	Do. J, 10 p. c. Prf.	317—322	..	3 2 2
476,000	„	„	6	Do. K, 6 p. c. Prf.	182—187	..	3 4 2
1,061,150	„	June 11	4	Do. 4 p. c. Db. Stk.	139—142	+1	2 16 4
294,850	„	„	4½	Do. 4½ p. c. do.	156—159	..	2 16 7
908,000	„	„	6	Do. 6 p. c. do.	207—212	..	2 16 7
70,000	10	May 13	8	Hongkong & China, Ltd.	14—15	..	5 6 8
3,800,000	Stk.	May 13	10	Imperial Continental	220—225	..	4 8 11
376,400	100	Aug. 3	4	Do. 4 p. c. Dbs. Red.	99—102	..	3 18 5
473,600	Stk.	Aug. 12	3½	Do. 3½ p. c. Db. Stk.	104—107	..	3 5 5
75,000	5	June 29	6	Malta & Medn., Ltd.	5½—6	..	5 0 0
560,000	100	Oct. 1	5	Met. of Mel- } 5 p. c. Db.	110—112	..	4 9 3
250,000	100	„	4½	bourne } 4½ p.c. Db.	106—108	..	4 3 4
541,920	20	June 11	5	Monte Video, Ltd.	15—16	..	6 5 0
150,000	5	May 27	8	Oriental, Ltd.	8¼—8¾	..	4 11 5
135,000	5	„	8	Do. New, £4 10s. pd.	7¼—7¾	..	4 12 10
15,000	5	„	8	Do. do. 1879, £1 pd.	1¾—2	..	4 0 0
60,000	5	Sep. 30	7	Ottoman, Ltd.	4¾—5	..	7 0 0
420,000	100	May 3	6	People's Gas } 1st M. Bd.	104—109	..	5 10 1
500,000	100	June 1	6	of Chicago } 2nd do.	105—110	..	5 9 1
250,000	10	Sep. 30	10	San Paulo, Ltd.	16¾—17½	+2	5 14 3
5,475,000	Stk.	Aug. 12	5¼	South Metrop., 4 p.c Ord	144—147	−1	3 11 5
1,416,667	„	July 15	3	Do. 3 p. c. Db. Stk.	106—109	..	2 15 0
60,000	Stk.	Sep. 15	12	Tottenham and } A.	280—290	..	4 2 9
60,000	„	„	9	Edmonton } B.	205—215	..	4 3 9
182,380	10	May 27	10	Tuscan, Ltd.	13½—14½	..	6 18 0
149,900	10	July 1	5	Do. 5 p. c. Dbs. Red.	102—105	..	4 15 3
				WATER COMPANIES.			
746,159	Stk.	June 29	10½	Chelsea, Ord.	337—342	..	3 1 5
150,000	„	„	5	Do. 5 p. c. Prf.	177—180	..	2 15 6
160,000	„	„	4½	Do. 4½ p.c. 1 f. Stk. 1875	157—160	..	2 16 3
175,785	„	Sep. 30	4½	Do. 4½ p. c. 1 b. Stk.	160—165	..	2 14 6
1,730,560	Stk.	Oct. 14	7½	East London, Ord.	232—237*	..	3 3 4
654,740	„	June 29	4½	Do. 4½ p. c. Db. Stk.	163—166	..	2 14 3
390,000	„	„	3	Do. 3 p. c. Db. Stk.	106½—107½	..	2 15 10
700,000	50	June 11	7½	G'd Junct'n, 10 p. c. max.	122—126	..	2 19 6
£95,000	£tk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—152	..	2 12 8
708,000	Stk.	Aug. 12	13	Kent	357—362	..	3 11 10
160,000	„	„	7	Do. New, 7 p. c. max.	215—220	..	3 3 7
1,043,800	100	June 29	9½	Lambeth, 10 p. c. max.	295—300	+3	3 5 0
406,200	100	„	7½	Do. 7½ p. c. max.	223—228	..	3 5 9
350,000	Stk.	Sep. 30	4	Do. 4 p. c. Db. Stk.	147—150	..	2 13 4
500,000	100	Aug. 12	13	New River, New Shares	450—455	..	2 17 1
1,000,000	Stk.	July 29	4	Do. 4 p. c. Db. Stk.	152—155	..	2 11 7
902,300	Stk.	June 29	5	Southw'k & V'xhall, Ord.	162—165	..	3 0 7
126,500	100	„	5	Do. do. 7½ p. c. max.	151—154	..	3 4 11
489,200	Stk.	„	5	Do. do. 5 p. c. Prf.	173—178	..	2 16 2
1,019,585	„	Oct. 14	4	Do. 4 p. c. A Db. Stk.	144—147*	..	2 14 7
1,155,066	Stk.	June 11	10	West Middlesex	317—322	+2	3 2 2
200,000	„	„	4½	Do. 4½ p. c. Db. Stk.	163—166	..	2 14 3

*Ex div.

have, a policy on broader and more satisfactory lines is likely to be the result. Treasurer Ritchie, addressing his constituents on Tuesday night, said, with reference to the gas-works extension, that if they could carry out the system which was in vogue in Glasgow it would be a great advantage to the community, and a saving to the ratepayers. To do this, however, would mean an expenditure of between £60,000 and £80,000; and, while he did not think they were prepared for this, there was no doubt they were face to face with a very serious expenditure so far as the gasholder accommodation was concerned. Looking over the accounts that day, he found that the manufacture of gas for this year was already 8½ million cubic feet more than for the same period in the previous twelve months; and it would never do for a great community like Dundee to be on the border of being thrown into darkness. In his opinion, they should acquire the ground to the east of the works, if it could be got on fair and reasonable terms; and were they to adopt the graded railway system, there would be a great saving in labour. Mr. Foulis estimated that they would save at least 1s. 6d. per ton on the coal carbonized; and, as they expected to use 55,000 tons of coal this year, they would see that the saving would be between £4000 and £5000. There was such a thing as spending liberally and yet making money; and if they could, by spending £20,000 or £30,000, save £4000 or £5000 on revenue charges, they would be making a considerable sum of money per annum. There were at present 464 stoves out on hire, and 1789 of them had been sold; and the demand for penny-in-the-slot meters had been very great. Already there were over 300 in use; and as soon as they could get more from the makers, they would be fitted up in houses in the city. This is not the language of an advocate of a policy of extension, far less of an enthusiast. Other speakers are on a lower grade of appreciation than this.

In Stirling, the opponents of the gas transfer are pursuing their bitter policy of exterminating the supporters of the transfer. There are two notable features of the contest this week. One is that the opponents have secured the services of an ex-Provost of the burgh—Mr. Yellowlees—as their champion; and the other is a vigorous speech by Bailie Lawson, who was one of the chief promoters of the transfer. The ex-Provost professed to hold the belief that "the rights of the public of Stirling were being trampled under foot." "The majority of the Town Council," he said, "forgot their duty to their constituents. The duty of popularly elected representatives was to guide the opinion of the public, and to express it—never to defy it." This is a string of truisms which nobody will care to call in question; but those who have memories will hesitate before they apply them to the recent gas controversy in Stirling. I, for one, do not recollect that the Town Council defied public opinion. They did try to guide it—whether wisely is another matter—but they were unsuccessful; a result which was due to tactics on the part of the opposition which they have no credit by. The matter should have ended with the defeat of the Gas Bill. But the cry is for revenge at the polls, which, in the matter of foolishness, is as the loins to the little finger. To take the case of Mr. Yellowlees alone, he is the advocate of an electric lighting installation which is the project of a Mr. Yorke, a local resident, and which Mr. Yellowlees prefers to a scheme which Professor Kennedy recommends. Mr. Yorke's proposal is in itself an extraordinary one. There is a fall of 200 feet between the reservoir from which the town's water supply is drawn and the filter-beds; and Mr. Yorke's idea is to put a turbine wheel upon this fall, by which means he expects to get 80-horse power. With this he would light the town. A brilliant suggestion, certainly, but one of which Professor Kennedy does not approve. Mr. Yellowlees, however, goes beyond even the dreams of Mr. Yorke. Last year the Corporation paid the Gas Company £604 for lighting the streets, and the School Board paid £72. Why, he asks, do this, when they could have their own light? He does not suggest that they would obtain the light for nothing; for he said he thought they would get the man at the filter-beds to look after the turbine for an extra half-crown a week. Electricity to light a town with a population of 17,000 generated for £6 10s. a year, beats everything I have heard of. If Mr. Yellowlees succeeds in persuading the electors, in face of Professor Kennedy's disapproval, that the scheme is feasible, it will be but another illustration of the gullibility of the people of Stirling. The peculiar thing, however, in Mr. Yellowlees' candidature is that, while Provost Kinross is held up to abuse because he, being a Director of the Stirling Gas Company, voted in favour of the transfer, ex-Provost Yellowlees, who is a Director of the Caledonian Electric Company, is an object of admiration, notwithstanding that he endeavoured to drive a rather hard bargain with the Corporation for the introduction of electricity into the town by his Company. Verily, in Stirling, that which is sauce for the Gas Director is no sauce for the Electricity Director. I have left no space for dealing with Bailie Lawson's speech, but I may say that it was a powerful defence of the action of the promoters, and that—a section of the ratepayers not caring to hear it defended, having already condemned it—it was delivered amid a good deal of interruption. It is almost a foregone conclusion that the promoters of the gas transfer will go to the wall at the polls; for the question is not whether there should be a transfer—there being now no proposal for a transfer in existence—but whether they can recover about £3000 from the promoters. It would be only natural that a majority of the ratepayers should consider it desirable that the money should be recovered. It need, therefore, cause no surprise should the whole of the promoters of the gas transfer be defeated.

The proprietor of a large tenement in Auburn Terrace, Invergowrie, was brought before the Dundee Police Court this week on a charge of failing to light the common stair leading to the dwellings. The defence was that he had provided paraffin lamps. The tenants stated that they had got the lamps, but no oil. The inspector of lighting said that, by the Police Act, it was the duty of the owner to provide gas-fittings; and he pressed for a conviction. The Magistrate gave an order for the fitting up of gas-lamps.

The Perth Water Commission had last year a revenue of £6634, of which £6282 was raised by assessment. The expenditure was £3857; and there was thus a balance of £2776. The Commissioners recently fixed the rates for water at the same figure as last year—viz., 6d. per pound domestic rate, and 3d. per pound upon shop rentals. These rates, it was stated, are the lowest for a pumped water supply in the United Kingdom.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 23.

Sulphate of Ammonia.—The quiet tone which has pervaded the market for the past few weeks has given place to a firmer feeling; and closing quotations are £8 2s. 6d. to £8 3s. 9d. per ton, delivered f.o.b. at the ports. The bulk of the business done has been on the level of last week's prices; and so far buyers seem disposed to resist the advance required. There has, however, been a decided improvement in direct export buying; and this must be regarded as a satisfactory feature as indicating the drying up of speculative resources for the time being. Dealers have been picking up cheap parcels; but for the most part they have kept in the background, trusting to the closing days of the month to enable them to cover the balance of their October requirements. London makers have advanced their price for November-March delivery to £8 5s. per ton, Beckton terms. This has given increased firmness to the forward position; and £8 10s. per ton, ordinary terms, is reported to have been paid f.o.b. on the East Coast for January-June. There is still speculative offering; but it is less prominent than it has been for some time.

Nitrate of Soda is rather firmer in the forward position; but spot values remain 7s. 4½d. for good, up to 7s. 6d. per cwt. for fine quality.

LONDON, *Oct.* 23.

Tar Products have not seriously altered during the week. Benzols are perhaps slightly easier, though considerable business has been done at higher prices here than appear to be possible on the Continent. Solvent naphtha is likewise in greater demand, at much better prices. Carbolic acid remains steady, at about 2s. Creosote has also benefited to some extent; and, notwithstanding the increasing production, the value is better. Pitch, although showing no fluctuation in price, is in good demand; and the stocks are greatly reduced—very few makers having any at all. Anthracene exhibits no change.

Prices may be taken as follows: Tar, 17s. to 21s.; Pitch, 17s. to 20s.; Benzols, 90's, 1s. 11½d.; 50's, 1s. 11d. Toluol, 2s. 2d. Solvent naphtha, 1s. 8d. Crude 30 per cent., naphtha, 11d. Creosote, 1⅞d.; liquid, 2½d. Heavy oils, 40s. Carbolic acid, 60's, 2s. Naphthalene, pressed, 52s. 6d.; salts, 27s. Anthracene, "A," 5½d.; "B," 4d. to 4½d.

Sulphate of Ammonia is in excellent demand; and buyers are willing to pay better prices. £8 2s. 6d. has been freely done; and £8 3s. 9d. to £8 5s., less 3½ per cent., is being asked.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position in the coal trade of this district has not been quite so strong as previously reported; and prices for the better qualities of round coal have scarcely been maintained at the maximum quoted rates. The exceptional weather of the past week has necessarily brought about a slackening off in requirements for house-fire purposes; and not only has all the talk of any further advance in rates with the close of the month disappeared, but representatives of collieries in some cases have been prepared to book orders at under the full prices they were quoting at the commencement of the month. Pits are, however, still kept on practically full time; and the output is moving away satisfactorily. At the pit mouth, best Arley coals can scarcely be quoted at more than about 10s. to 10s. 6d. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; and common house coals, about 7s. to 7s. 6d. The lower qualities of round coal continue in but indifferent request, for iron-making, steam, and general manufacturing purposes. Supplies are, if anything, rather more plentiful, with prices only barely maintained at late rates; 6s. to 6s. 6d. per ton at the pit being about the average figures at which ordinary steam and forge coals can be bought. Engine classes of fuel are also plentiful. The threatening outlook in the cotton industry is necessarily having a depressing effect. But where there is any giving way in prices, it is still chiefly on temporary clearance sales; colliery proprietors being very firm in their quotations for forward contracts. At the pit, common slack averages 3s. to 3s. 6d. per ton; medium sorts, 3s. 9d. to 4s. 3d.; and best qualities, 4s. 6d. to 4s. 9d. Shipping is moderate; but steam coals do not average more than 8s. to 8s. 3d. per ton delivered at the Mersey ports, and 8s. 3d. to 8s. 6d. for delivery at the Manchester Docks.

Northern Coal Trade.—There has been a lessened demand for steam coals, and slightly lower rates; but for gas coals, the inquiry is increasing, and the price decidedly firmer of late. Best Northumbrian coals are now about 8s. 3d. per ton f.o.b. for forward delivery, and 8s. 4½d. for prompt; second-class steam, 7s. 9d. to 8s.; and steam smalls, 3s. 3d. to 3s. 6d. There is still only a languid feeling in household coals; the mild weather having limited the use, and kept the price at about 10s. per ton f.o.b. The gas coal trade is very active; and the deliveries to the great gas companies will further increase in a few days, so that the full output of all the chief Durham collieries will be taken up. It is this fact which renders prices so high for odd cargoes. The chief producers, having sold the bulk of the output, can ask high rates for any surplus; and thus while large quantities of gas coal are being delivered at 6s. 6d. per ton, there is asked for occasional cargoes 8s., and even more. The gas coke trade is steady. Some of the companies are trying to foster its use for household purposes, and offer it delivered in the large towns at 6s. 3d. for 12 cwt., or 10s. 2d. per ton delivered at the residences of buyers.

Scotch Coal Trade.—Very little change falls to be recorded. Steam coal is in fairly satisfactory demand. Ell is well booked up, and is likely to be so for some time. Splint is plentiful; but there is a ready outlet for it. Main is unchanged. The prices quoted are: Main, 7s. per ton f.o.b. Glasgow; ell, 7s. 6d. to 7s. 9d.; and splint, 7s. The shipments for the week amounted to 164,910 tons—a decrease of 277 tons on the preceding week, but an increase of 14,444 tons over the corresponding week of last year. For the year to date, the total shipments have amounted to 6,408,577 tons—an increase over the same period of 1896, of 266,438 tons.

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"JOHN J. JERVIS,
"*Secretary and Manager.*

28/6/1897.

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"DEAR SIRS,—I feel that it is now our duty to express our opinion upon the Water-Gas "Plant erected by you for this Company, and started in February last. We were satisfied "then with the Workmanship and Materials; and now, after Five Months of Continuous "Working, we have much pleasure in stating that the working of the Plant and the results "attained are very satisfactory indeed.

"I am, yours faithfully,

"(Signed) JOHN J. JERVIS,

"J. T. WESTCOTT, Esq. "*Secretary and Manager.*"

N.B.—The M.-W.-P. Plant is built under penalty to Manufacture Gas on less Raw Material than any other Plant on the Market.

All Enquiries to be Addressed to the Company's Offices.

A New Gas and Electric Light Company in New York.—The New York Correspondent of "Lightning" reports the formation in New York of the Northern Union Gas Company, with the object of producing both gas and electricity for heating and lighting purposes.

New Capital for the Falmouth Water Company.—At an extraordinary meeting of this Company held in London last Wednesday, the Directors were authorized to take the necessary steps for raising £5000 of 5 per cent. preference stock, to rank equal with the existing 5½ and 6 per cent. preference stock. This will make the capital £48,750.

The Maldon Town Council and the Water-Works.—An application having been made by the Maldon Water Company, Limited, for the consent of the Maldon Town Council to an application for a Provisional Order under the Gas and Water Works Facilities Act, the matter was referred to a Committee, who at the last meeting of the Council recommended that the consent should not be given, but that steps should be taken to acquire the works, if suitable terms could be arranged. The recommendation was agreed to.

Ceara Gas Company, Limited.—At the annual general meeting of this Company next Friday, the Directors will report an increase of nearly 11 per cent. in the consumption of gas in the year ending June 30 last, as compared with the preceding twelve months. The net profit is £3475, which added to the balance standing over (£134) makes £3609. Deducting the interim dividend paid in April, there is a sum of £1998 available for distribution; and the Directors recommend a dividend of 5 per cent. on the preference shares (less income-tax), and of 4 per cent. on the ordinary shares (tax free), for the past six months. There will be left a balance of £88 to be carried forward.

Oil Gas Enrichment Company, Limited.—In the Directors' report and statement of accounts for the year ending Sept. 30, it is stated that the balance at the credit of the profit and loss account is £554, which they recommend should be disposed of as follows: To pay the fixed dividend of 5 per cent. on the preference or "A" shares, £250; to write off one-half of balance of preliminary expenses, £162, leaving £142 to be carried forward. The Directors state that the Peebles process continues to give satisfactory results, and has been introduced into additional works during the past year. The low price of cannel coal and the higher price of gas oil have, however, militated against its more rapid extension.

Strike of Gas Stokers at Heywood.—Last Friday the stokers employed at the Heywood Corporation Gas-Works turned out on strike. It appears that earlier in the week it had been intimated to one of the men that his services would be dispensed with; the cause of this being, we learn, a matter of discipline. The whole of the stokers left their work, and refused to return to it except on certain conditions, which the Manager (Mr. W. Whatmough) could not accept. The yardmen also left their work. A meeting of the Gas Committee was held on the following day; and the discharged man was reinstated on apologizing to the Committee for his conduct. The men thereupon returned to work.

Reduction in the Price of Pudsey Gas to Bradford Moor Residents.—Speaking at a municipal election meeting, last Wednesday, in the Bradford Moor Ward, the Mayor of Bradford (Mr. T. Speight) said that he had received an assurance from the Secretary of the Pudsey Gas Company that from July 1 the price of gas would be reduced to 2s. 6d. per 1000 cubic feet, with a discount of 2½ per cent. for sums under £50, and of from 5 to 10 per cent. for sums over £50. This would make a difference of 3d. per 1000 cubic feet. The price to the Bradford Corporation for gas for public lighting purposes was also to be reduced to 2s. 3d. An endeavour would be made to reduce the price afterwards 1d. per year until it was equal to the Corporation charge of 2s. 3d. The reduction is to be retrospective, and will probably be general.

Extensions at the Saltley Gas-Works, Birmingham.—Owing to the greatly increased demand for gas at Birmingham, the Corporation are about to erect a four-lift telescopic gasholder at their Saltley works. The outer lift will be 261 feet in diameter, and each lift upwards of 41 ft. 6 in. deep; and when finished the holder will contain about 8¼ million cubic feet of gas. The manufacture and erection of this huge holder has been placed in the hands of Messrs. C. & W. Walker, of Donnington, Shropshire. The same firm have also just completed the erection of five large purifiers, with roofing, columns, and girders, a large tank for the storage of oil, and a gasholder 80 feet in diameter—the whole being practically a duplication of what was done by them at the same works last year, and being required for the installation of water gas.

Colonial Gas Association, Limited.—The accounts of this Company for the year ending June 30 show a profit of £3844, including 1066 bonus shares of 10s. each in the Charters Towers Gas Company, which have been taken at par. Of the above sum, £754 was distributed as interim dividend; and after providing for interest on debentures, there remains a balance, including the amount brought forward, of £2256. The Directors recommend a dividend at the rate of 3 per cent., which will require £1134. They also propose to transfer the £533 representing the bonus shares in the Charters Towers Company to a reserve fund—leaving £589 to be carried forward. The Directors report that the new Geraldton Works were opened in April last; and satisfactory progress has already been made with the public and private lighting. The Board are of opinion that the prospects of the Colonies are brighter, and that the Association have reason to expect a gradual improvement.

The Rochdale Corporation and the Todmorden Water-Works.—An authoritative statement has been issued by the Manager of the Todmorden Water Company (Mr. J. Radcliffe) regarding the proposed purchase of the Company's works by the Rochdale Corporation. He says: "After considerable negotiations, the Directors have entered into a provisional agreement to sell their undertaking to the Rochdale Corporation, who already possess powers of supply over part of the Company's area." The details of the arrangements will in due course be submitted to the shareholders. In the meantime, Todmorden appears to be preparing to fight both Rochdale and the Company. Notice has been given of a special meeting of the Council to-morrow, to consider the expediency of promoting a Bill to empower the Corporation to purchase the undertaking of the Company, to exclude all other authorities from supplying water in the borough, and to repeal or amend the Todmorden Water Act, 1882, and the Rochdale Water Act, 1847.

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Or with Fuel Fire and Flue same Price.

The Leeds Fire-Clay Company, Limited, have received a diploma of honour and a gold medal at the Brussels Exhibition.

The Directors of the Monte Video Water-Works Company, Limited, have declared an interim dividend at the rate of 5 per cent. per annum, tax free, for the half year ending June 30.

The Lamp Manufacturing Company, Limited, of Leonard Street, City Road, last week despatched the completion of their order for lamps—of the Coligny patent saloon-car type—for the Comte de Flandres' private carriage on the Belgian State Railway.

We have received copies of the very tastefully printed catalogues of the gas cooking and heating and domestic labour-saving appliances manufactured by Messrs. Fletcher, Russell, and Co., with supplements showing the various types of their patent "Fireglow" stove, which is the latest addition to the firm's already long list of articles designed for the effective utilization of the calorific power of gas.

Among recent contracts entrusted to Messrs. W. C. Holmes and Co., of Huddersfield, are the following: A telescopic gasholder 60 feet in diameter and 20 feet deep, governor, bye-pass valves and connections, 12-inch mains, &c., for the Wilmslow and Alderley Edge Gas Company; patent "New" scrubber-washers for the Eccleshill, the Kelso, and the Wishaw (N.B.) Gas-Works; and scrubbing, purifying, and exhausting plant, and other extensions at Cleator Moor, Cottingham, Nuneaton, &c.

The Incandescent Gas-Light Company, Limited, are warning the public, by means of boldly-printed circulars distributed to their agents and the trade generally, that, having spent enormous sums in establishing the validity of their patents, and in proceedings against dealers and importers of infringing mantles, it is their intention to strictly enforce their legally-established rights against all users of such mantles, who will lay themselves open to the payment of damages and costs, and the delivery up of the infringing articles.

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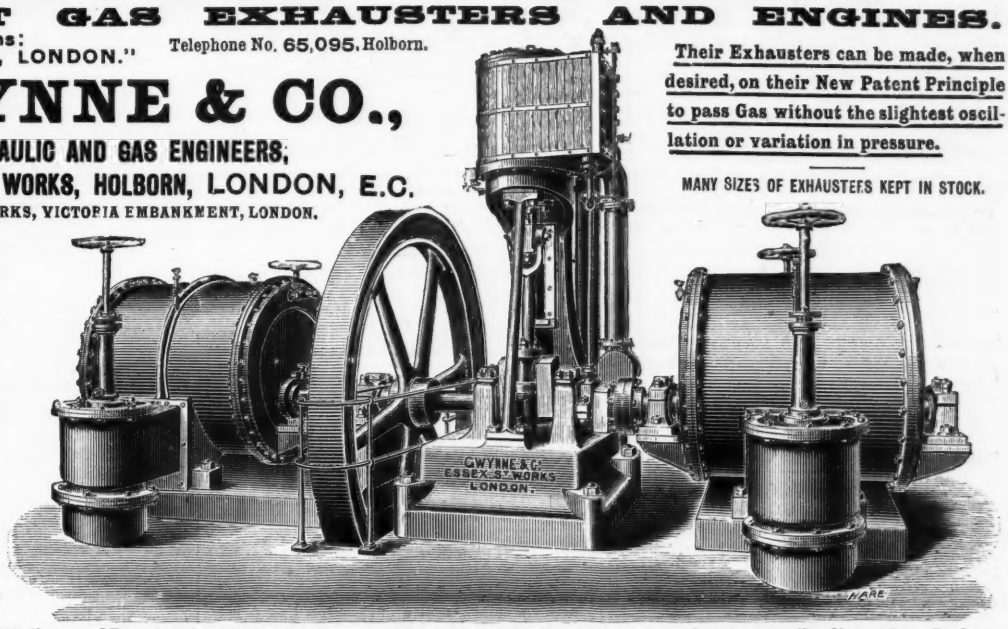

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[For Illustrated Advertisement, see Oct. 5, p. 758.]

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STEPHEN CARPENTER, on the PURIFICATION OF COAL GAS BY LIME, OXIDE OF IRON, AND ATMOSPHERIC AIR, and the Method of Working Purifiers so that the Lime may be used a second time, with a Description of Carpenter's short Method of Working off the Sulphur Test, and Table for Calculating Results.

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PATENTS FOR INVENTIONS.

J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE. Information and Handbook on application. 70, CHANCERY LANE, LONDON, W.C.

CANNEL, COAL, ETC.

JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS. Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

GAS Companies in Formation, Local Bodies, &c., desirous of LIGHTING THEIR DISTRICTS, may have VALUABLE INFORMATION by preliminarily consulting the Advertiser. Address, in first instance, No. 2920, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Gas-Fitter. Used to Iron and Compo. Work, Stoves, Fires, and Meter Fixing, Main and Service Laying. Twenty-four Years of Age. Good References. Address 7, Belgrave Street, Stoneyholme, BURNLEY.

FOREMAN (Age 30) seeks Engagement as such or as WORKING MANAGER of small Gas-Works. Thoroughly practical in the Manufacture and Distribution of Gas, and the Erection and Repairing of Plant. First-class Testimonials and References. No objection to going abroad. Address No. 2941, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND MANUFACTURERS.

GENTLEMAN, with extensive experience in Gas Engineer's and Manufacturer's Office, and accustomed to Travel, is open to ENGAGEMENT. Could introduce first-class connection among Gas Companies. Address No. 2936, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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A WELL-INTRODUCED Firm in the gas line in Switzerland, with Travellers covering the whole Country, are prepared to take up the AGENCY of a Manufacturer of Brass Gas-Fittings. First-class References. Please address, stating Terms, H. 4679 Z, care of Haasenstein and Vogler, Advertising Agents, ZURICH.

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WANTED, a good General Fitter for Iron and Compo. Apply to W. C. JONES, Manager, Gas-Works, Kingswinford, DUDLEY.

WANTED, for a small Gas-Works, a STOKER who understands Engine and Exhauster, and would make himself generally useful. Apply to the MANAGER, Gas Company, Knighton, RADNORSHIRE.

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A VACANCY for a Young Gentleman in the Engineering and other Departments of a Water-Works, in the Home Counties. Term Four Years. Premium. Apply, by letter, to No. 2940, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

IRTHLINGBOROUGH GAS AND COKE COMPANY, LIMITED.

WANTED, by the above Company, a thoroughly competent GAS-FITTER and MAIN and SERVICE LAYER. Apply, stating Age and Wages required, with References, to J. T. LEWIS, Gas-Works, WELLINGBOROUGH.

GAS MANAGER WANTED.

THE Directors of the Carlow Gas Company will, on Friday, the 5th of November next, at Eleven o'clock, proceed to appoint a qualified GAS MANAGER, at a Salary of £80 a year, with Apartments, Fuel, and Light. Applications and Testimonials to be sent to the Secretary.

EAMES ROGERS, Secretary.

TO GAS-METER MAKERS.

WANTED, a thoroughly competent METER MAKER to repair Dry Gas-Meters at the Halifax Corporation Gas-Works. None but competent steady Men need apply. Good Wages and permanent Employment given to a suitable Man. Apply, stating Age, Experience, Wages required, and References, to the undersigned.

THOMAS HOLGATE, Engineer and Manager.

Gas-Works, Halifax, Oct. 18, 1897.

GAS-WORKS WANTED.

A CAPITALIST desires to acquire an established Works as a going Concern, or to negotiate for Gas Concessions. Address "CAPITAL," care of Fisher & Co., 23, LEADENHALL STREET, E.C.

GAS CARBON Wanted, not less than 4-Ton Loads. Apply to the BIRMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

SUTTON AND HOOTON GAS COMPANY, LTD.

THE above Company desire to purchase a Set of good second-hand PURIFIERS and a TOWER SCRUBBER, with a capacity of about 4000 Cubic Feet per hour. Particulars and Prices to Mr. ISAAC CARR, Consulting Engineer, Farnworth, WIDNES.

SULPHURIC Acid for Sale B.O.V. and R.O.V. made from Sulphur. Inquiries solicited. J. HARDMAN, Chemical Works, Milton and Tunstall, STAFFS.

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EVANS' 60-inch Photometer, by Sugg, FOR SALE. Address No. 2934, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-PUMP for Sale, horizontal, one Steam Cylinder, 18-inch bore, and two Gas Cylinders, 17½-inch bore, all 24-inch Stroke, on massive Bed-Plate, with heavy Fly-Wheels. Very strong. First-Class Make. Not much used. Apply, by letter, to No. 2878, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE — A Modern Sulphate of AMMONIA STILL, built by Messrs. R. & J. Dempster, Manchester, 1893, with separate Liming Compartment. Capacity, with ordinary Liquor, 5000 to 6000 lbs. of Sulphate per day. For further Particulars, apply to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. **Compare Prices and Particulars before ordering elsewhere.** J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for COKE ELEVATOR, BREAKER, &c. A general Specification and further Particulars may be obtained upon application to the Gas Manager, Mr. W. Whatmough, to whom Designs and Specifications should be sent not later than Wednesday, Nov. 10, 1897. Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union Rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the tender is sent in. Sealed tenders, endorsed "Coke-Breaking Apparatus," to be sent to me not later than Tuesday, the 16th of November, 1897.

(Signed) J. H. BALDWICK, Town Clerk.

Municipal Buildings, Heywood, Oct. 20, 1897.

SOUTHBOROUGH URBAN DISTRICT COUNCIL.

LAYING NEW GAS-MAIN.

THE Urban District Council invite TENDERS for CUTTING TRENCHES and the LAYING and JOINTING of about 2400 yards of CAST-IRON GAS-PIPES, 10 inches in diameter, in the Streets and Lanes leading from the New Gas-Works on the Liptraps Park Estate to the junction of Speldhurst Road with London Road at Southborough. The Plan may be seen and Copies of Specification, with Schedule of Prices, may be obtained at the Office of the Engineer, Mr. Corbet Woodall, Palace Chambers, Bridge Street, Westminster, S.W., or at the Urban District Council Offices, Southborough. Ten Shillings and Sixpence will be charged for copies of the Specification, which will be returned upon receipt of a *bond-fide* tender. Tenders, marked "Tender for Laying Gas-Mains," and addressed to the undersigned, are to be delivered at the Council Offices, Southborough, not later than Thursday, the 11th day of November, 1897. The lowest or any tender will not necessarily be accepted.

By order of the Urban District Council, PHILIP HANMER, Clerk.

Council Offices, Southborough, Oct. 18, 1897.

SOUTHBOROUGH URBAN DISTRICT COUNCIL.

WATER-MAINS EXTENSION.

THE Urban District Council invite TENDERS for PROVIDING and LAYING IN about 550 yards of THREE-INCH CAST-IRON SOCKETED WATER-MAINS, with Fittings, &c., on New Roads at High Brooms, Southborough. The Plan and Specification may be seen, and copies of Bill of Quantities obtained, at the Urban District Council Offices, Southborough. Ten Shillings and Sixpence will be charged for copies of the Bill of Quantities, which will be returned upon receipt of a *bond-fide* tender. Tenders, marked "Tender for Water-Mains," and addressed to the undersigned, are to be delivered at the Council Offices, Southborough, on or before Thursday, the 11th day of November, 1897. The lowest or any tender will not necessarily be accepted.

By order of the Urban District Council, PHILIP HANMER, Clerk.

Council Offices, Southborough, Oct. 18, 1897.

PATENT FOR SALE.

THE Inventor of a Retort-Lid Fastening, which is well spoken of, and has met with a considerable measure of success, is anxious to dispose of his PATENT RIGHTS to a Firm of Manufacturers, or other Capitalists, for a Sum down or by Instalments, as may be agreed. Full Particulars will be sent on application, by letter, to No. 2927, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FIRE-CLAY GOODS.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for the supply of FIRE-CLAY GOODS (Retorts, Bricks, &c.) required for Repairs at their Neepsend and Effingham Street Stations during the next Twelve Months. Specification and Forms of Tender may be had on application to the Company's Engineer, Mr. Fletcher W. Stevenson. The Directors do not bind themselves to accept the lowest or any tender. Sealed tenders, marked "Tender for Fire-Clay Goods," addressed to the undersigned must be delivered by post not later than the first post on Saturday, the 30th inst.

HANBURY THOMAS, General Manager and Secretary.

Commercial Street, Sheffield, Oct. 12, 1897.

CEARA GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY ANNUAL GENERAL MEETING of the Shareholders will be held at the Offices of the Company, 9, Queen Street Place, Cannon Street, in the City of London, on Friday, the 29th day of October, at One o'clock in the Afternoon, to receive the Report of the Directors, to declare a Dividend, and for general purposes.

By order of the Board, THOMAS GUYATT, Secretary.

Oct. 1, 1897.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE OF WATER SHARES.

TO be Sold by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Wednesday, Nov. 10, 1897, at Half-past Three o'clock in the Afternoon,

Mr. ATKINSON GIBSON, Auctioneer,

£50,000 OF THE NEW STOCK

(Maximum Dividend 5 per cent.) authorized to be created and issued under the Powers contained in the Sunderland and South Shields Water Act, 1891. The above Stock will be entitled to Dividend from the 1st day of January, 1898, and be registered in the name of the Purchaser free of charge. A Deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on Jan. 3, 1898.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Power. He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C. Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards. Offices: 18, FINSBURY CIRCUS, E.C.

SALE TUESDAY, NOV. 16, 1897.

ALDERSHOT GAS AND WATER COMPANY. 300 £10 5 PER CENT. PREFERENCE SHARES. (A new issue by order of the Directors.)

CATERHAM AND DISTRICT GAS COMPANY. £3000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK. (A new issue by order of the Directors.)

WINCHESTER WATER AND GAS COMPANY. Five £25 FULLY-PAID SHARES.

MR. ALFRED RICHARDS will sell the above BY AUCTION, at the Mart, E.C., on Tuesday, Nov. 16, at Two o'clock, in Lots. Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Now Ready, Price 15s., Limp Cloth, the Seventeenth Yearly

ANALYSIS OF THE ACCOUNTS

OF THE

METROPOLITAN WATER COMPANIES,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended Dec. 31, 1896, or March 31, 1897, together with the Quantity of Water supplied, the estimated Daily Quantity supplied for Domestic and other Purposes, the Quantity supplied per Head of Population, &c., &c., for the Year ended Dec. 31, 1893.

Compiled and arranged by

ALFRED LASS, F.C.A.

LONDON: WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

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FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

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BOGHEAD CANNEL

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TORBANEHILL MINERAL.

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Are the only Producers of the famous original

BOGHEAD CANNEL or TORBANEHILL MINERAL.

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GLASGOW.

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SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

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THE STAFFORDSHIRE TUBE CO.

TELEGRAMS:
"EVESON, BIRMINGHAM."

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per ton .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON NEWCASTLE."

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

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THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895,*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

THE SILICA FIRE-BRICK

COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21 JOHN STREET, ADELPHI, LONDON, W.C

Telephone: Castleford No. 216. | Postal Address: Castleford.
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Steam, Manufacturing, & Gas Coals & Cannel

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TROTTER, HAINES, & CORBETT,

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FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas. Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS, Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS,

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

STOKERS' GLOVES.

GEO. BOULTON & SON, Wholesale Glove Manufacturers, **75, Goswell Rd., London, E.C.**

Will be pleased to send Sample Patterns and Prices to the Managers and Engineers of Gas Companies, similar to those which have been supplied by them to the South Metropolitan Gas Co., The Gaslight and Coke Co., Commercial Gas Co., and others, for 30 years past.

ALL KINDS OF STOUT LEATHER GLOVES for FURNACE or SMELTING WORKS MADE TO ORDER.

WOMBWELL MAIN COMPANY, LD.,

BARNSLEY.

BEST GAS COAL.

ANALYSIS: 11,390 feet of 17-Candle Gas. Value in Sperm per ton, 686 lbs.

By R. O. PATERSON, C.E.

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WOMBWELL MAIN COMPANY, LIMITED, BARNSLEY.

Telegrams: "MAIN, WOMBWELL."

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

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ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

HEBBURN MAIN GAS COALS.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.
For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.,
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

E. ASQUITH & CO.,
Hydraulic Engineers,
17, Mather Street, Ancoats, Manchester,
Fit up Plants for
Pressing Anthracene, Naphthalene, &c.
Competent Men sent out to erect same. Estimates given.

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CLAYTON, SON, & CO.
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.
PRICES ON APPLICATION.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-Candle Power
PLAIN IRON LAMP,
CLASS A— **55/-**
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.
HENRY GREENE & SONS,
153 & 155, CANNON STREET,
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PARTICULARS AND PRICES FREE. AGENTS WANTED.

G. & J. HAIGH,
Raven's Lodge Fire-Brick Works, DEWSBURY.
FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character, suitable for GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.
WHITE GLAZED AND SALT GLAZED BRICKS, BUFF FACING BRICKS, &c.
For Prices and Analysis, apply as above.

STOCKPORT GASHOLDER.

Two Lifts added to a Two-Lift Holder, 160 ft. by 32 ft.,

WITHOUT REMOVING THE WATER FROM THE TANK.

WITHOUT ADDING TO THE COLUMNS.

The Crown Trussing is now carried on Supports; and the Pressure of the Four Lifts is practically that of a Three-Lift Holder with a Trussed Crown.

WE RESPECTFULLY ASK GAS ENGINEERS TO CONSIDER WHETHER THEY HAVE NOT HOLDERS THAT COULD BE ADVANTAGEOUSLY ENLARGED IN A SIMILAR MANNER.

ASHMORE, BENSON, PEASE, & CO., LIMITED,
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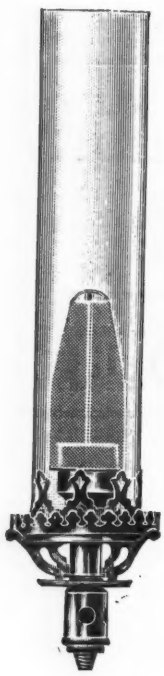

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STREET-LAMPS

HIGH ILLUMINATING POWER WITHOUT CHIMNEYS

(SHELDRAKE'S PATENT)

WILL SHORTLY BE READY.

Price Lists, &c., on application.

The NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING CO., LIMITED,

33 & 34, SHOE LANE, LONDON.

PENNY-IN-THE-SLOT GAS-METERS,
SHILLING-IN-THE-SLOT METERS.
Every Description of ORDINARY GAS-METERS.

THE AUTOMATIC
GAS-METER (1895) CORPORATION, LTD.

ROCK METER WORKS,
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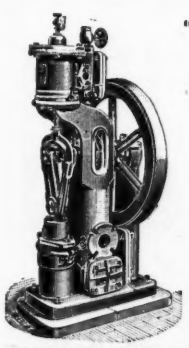

Fig. 703. "SINGLE RAM" STEAM-PUMP.

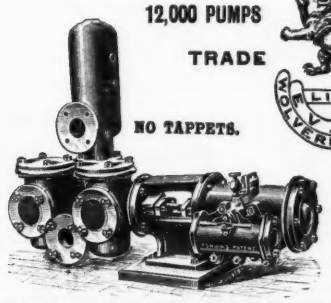

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

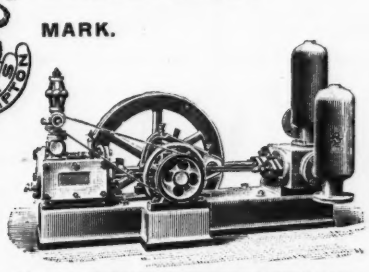

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

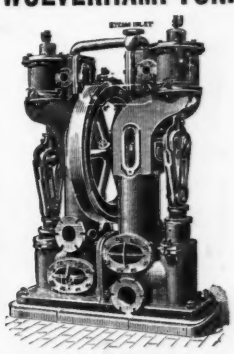

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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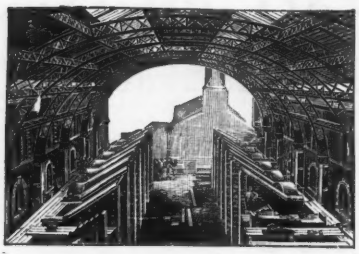

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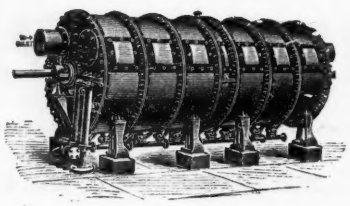

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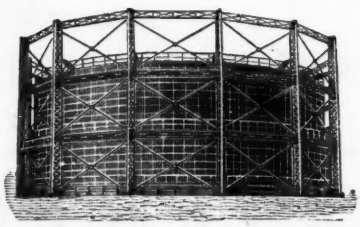

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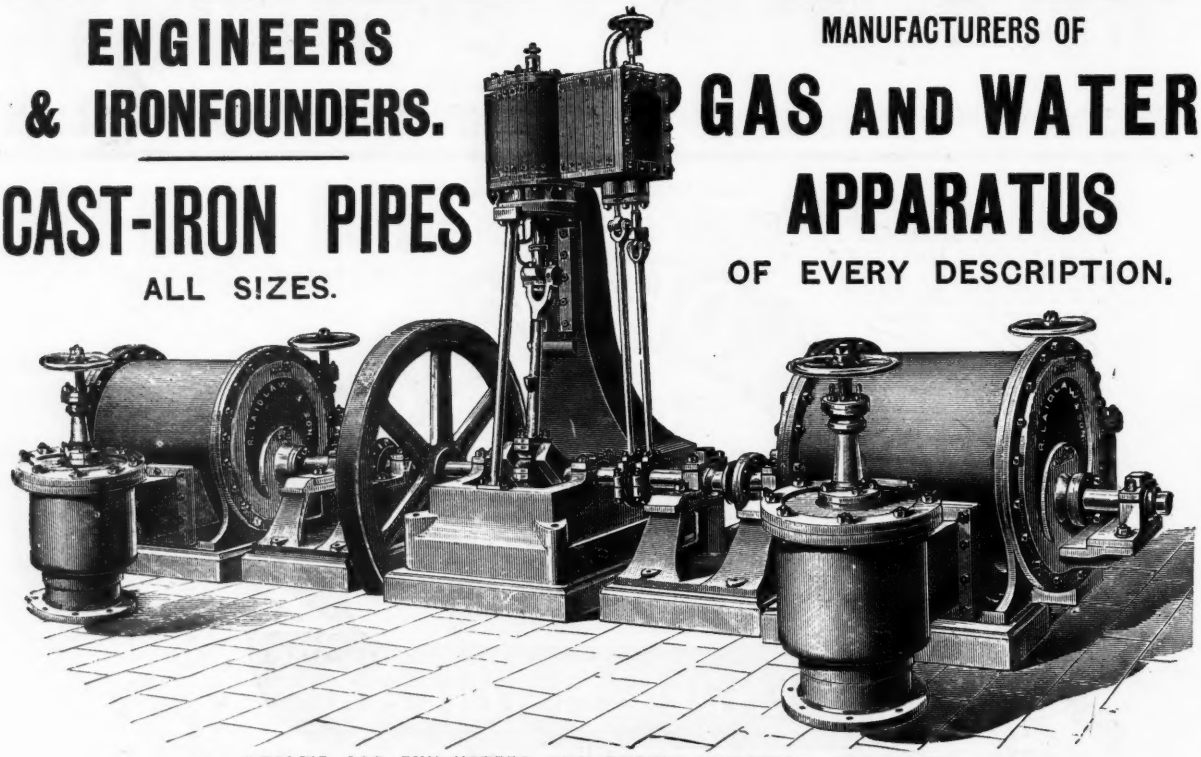

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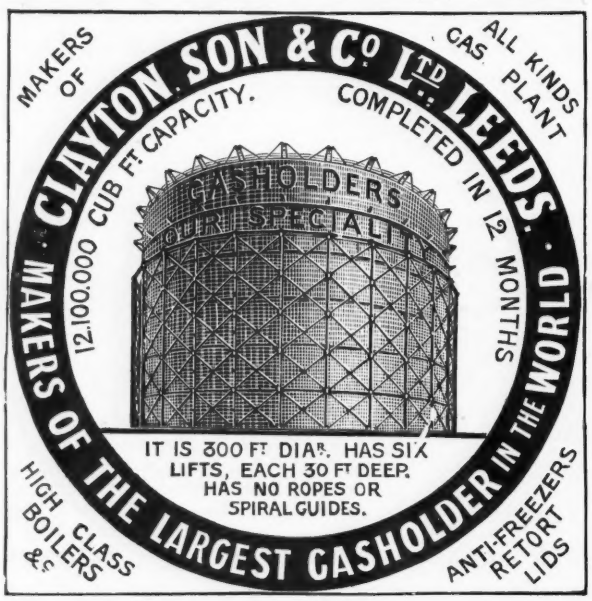
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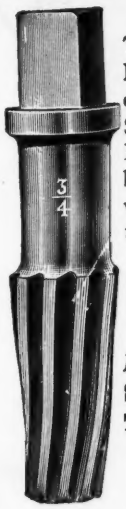

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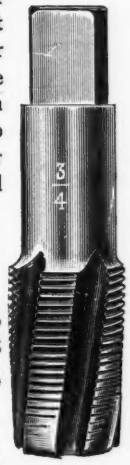

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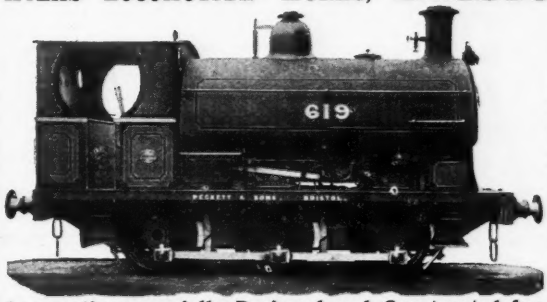

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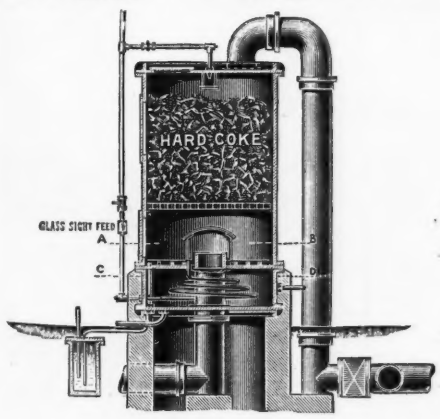

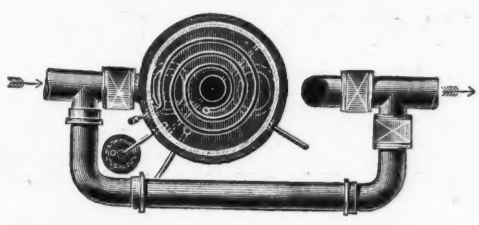

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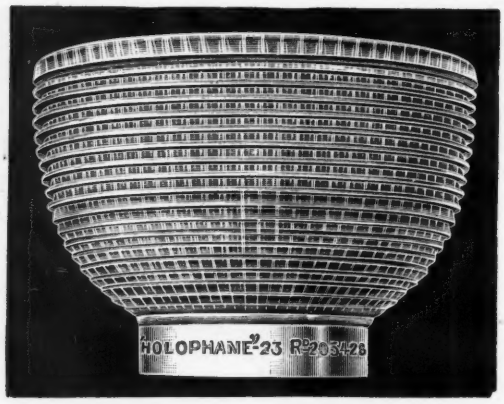

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